ELECTRICAL REVIEW

FRIDAY
24 JUNE 1960

WEEKLY
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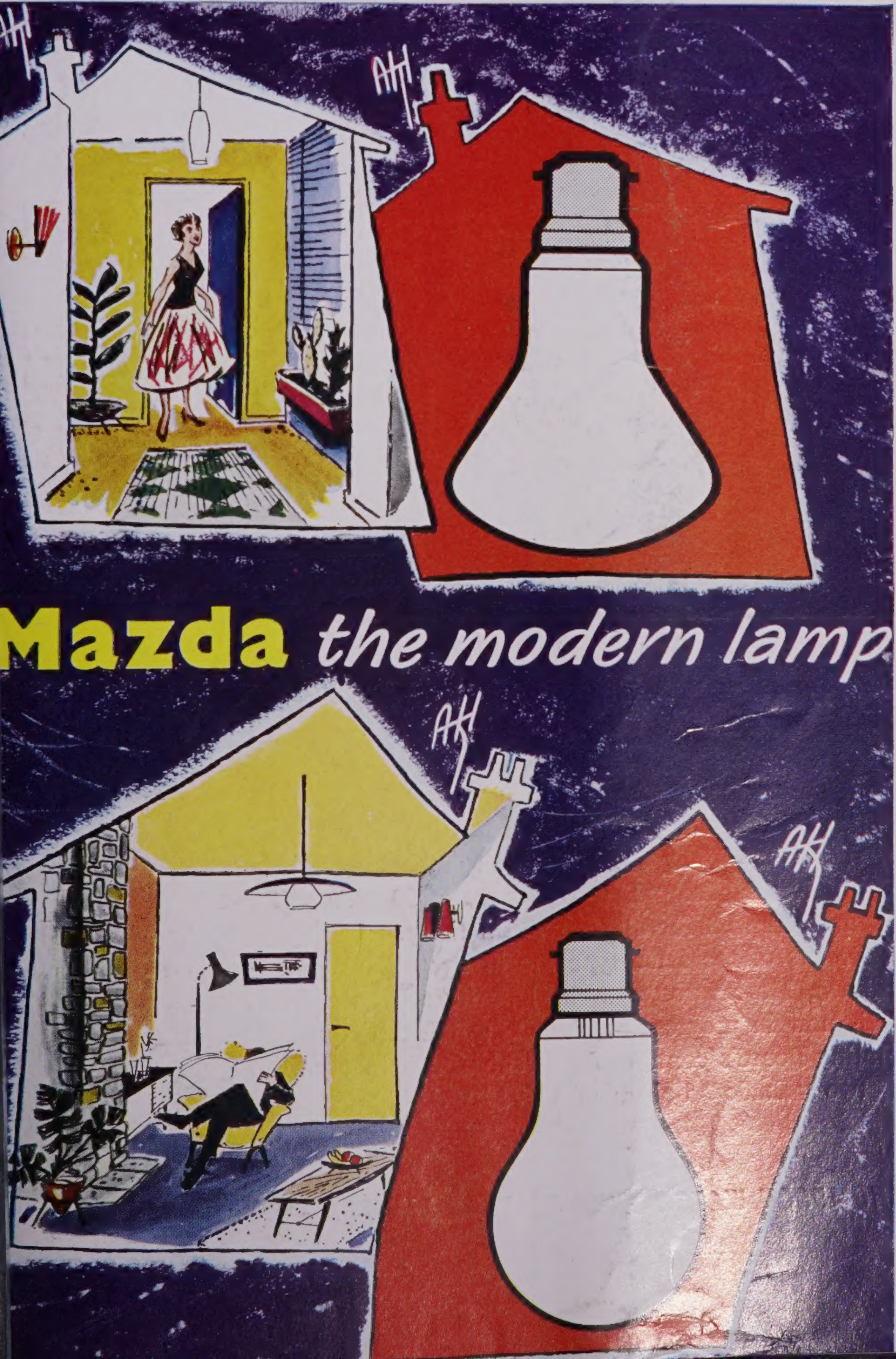
Mazda the modern lamp for—

THE MODERN HOME

The reliable Mazda GLS lamp has been completely restyled to meet the demands of the modern home. Result: the NETABULB. Netabulbs retain all the proven qualities of the ordinary Mazda lamps, but are more pleasing and compact in shape, and provide the advantages of coiled-coil filaments and Silverlight finish.

AEI
Lamp and Lighting Co Ltd
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4838

"Etaflo" Water Tube Boilers at Tilbury

For the Central Electricity Generating Board's power station at Tilbury John Thompson have supplied 6 pulverised fuel "Etaflo" boilers of 60 M.W. These boilers are arranged for alternative oil firing.

Boilers of the same type are in operation at Brimsdown, Marchwood and Bold power stations. Work is now in progress on the Central Electricity Generating Board's contract for Richborough incorporating two "Etaflo" boilers of 120 M.W.

JOHN THOMPSON GROUP

JOHN THOMPSON WATER TUBE BOILERS LIMITED - WOLVERHAMPTON

WTB/7

Heatrae *of Norwich*

present

The most up-to-date AUTOMATIC ELECTRIC WATER HEATER

Only 10″ wide, yet delivering up to 9 gallons of hot water per hour.

The Heatrae "Express" marks a big jump forward in Electric Water Heater design.

The economy eye glows when the current is on and is extinguished when the correct temperature is reached.

The special dispenser outlet ensures smooth even flow and instant cut-off when closing the valve.

Available in loadings of 3 kW. or 2 kW. at 230/250 volts, or 200/220 volts, A.C. only.

Finished cream or white.
Price: £10.12.6 plus P. Tax: £2.1.5.

Full details on Leaflet No. 92 sent on request.

Heatrae Lido 'Express'

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GALLONS of PIPING HOT WATER per hour—every hour!

Manufacturers of Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Electric Fires, Flameproof Heating Apparatus, Food Trolleys, Warming Plates, Air Heaters. Specialists in Steam Heated Oil Heaters and Calorifiers for Shipboard.

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VOLTAGE CONTROL

Expamet-Cressall resistors, rheostats and heaters form the most comprehensive range available from a single source and units to control loads from 4 watts to over 20,000 Kilowatts have already been supplied. The introduction of new designs of associated equipment widens still further the enormous field of applications of Expamet-Cressall products. Further details and technical advice from our engineers is freely available.

EXPAMET and CRESSALL
go together all the way

Expamet Cressall

The Electrical Division of The Expanded Metal Company Ltd.

London Office: 16 Caxton Street, London, S.W.1
Telephone: ABBey 7766
Works: Stranton Works, West Hartlepool
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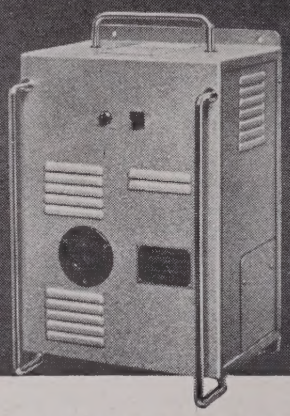
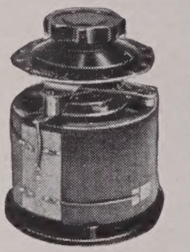
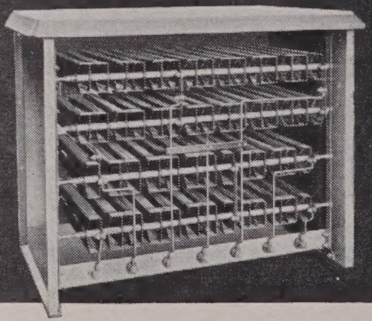
The Cressall Manufacturing Company Ltd.
Eclipse Works, Tower Street, Birmingham 19
Telephone: Aston Cross 2666



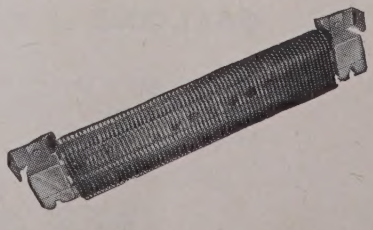
A range of A.C. Mains Voltage Stabilisers has been developed which incorporate electronic detector systems of new design, and are robust, reliable and very compact.



Torovolts are new toroidally wound continuously variable auto-transformers. Electrical and mechanical improvements give greater safety and reliability. Legible dials give maximum convenience in use.



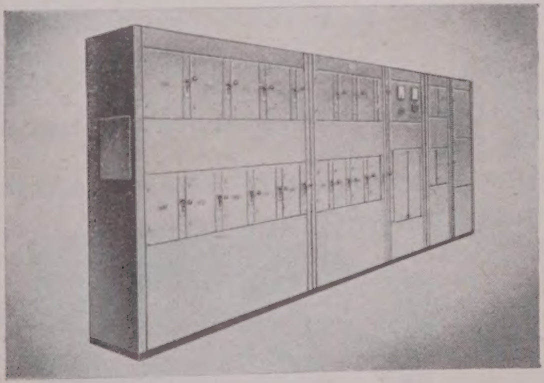
"Expamet" expanded metal resistors are able to dissipate heavy electrical loads efficiently through long continuous service.

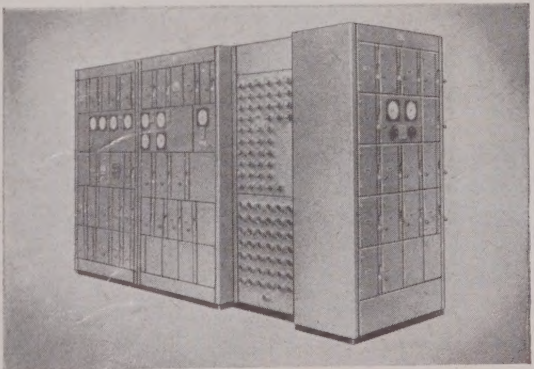


The "Edgemet" edge-wound strip type resistor for confined space and high temperature conditions.

You cannot buy better gear

The Modern Switchgear – for Modern Buildings





MAJESTIC MEDIUM VOLTAGE SWITCHBOARDS ARE BEING SPECIFIED WITH EVERY CONFIDENCE BY LEADING ARCHITECTS, CONSULTING ENGINEERS, ELECTRICITY BOARDS AND INSTALLATION ENGINEERS FOR MODERN TECHNICAL COLLEGES, HOSPITALS, CIVIC AND INDUSTRIAL BUILDINGS.

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An entirely new range . . .

- ★ M.E.M. "Kantark-Exel" 500 volt Distribution Fuseboards to B.S. 214/1959. Rewirable or H.R.C.
- ★ Rated 15-100 amps. 500 volts.
- ★ S.P. & N.—D.P.—T.P. and T.P. & N.
- ★ Rewirable Fuses to B.S. 3036/1958.
- ★ H.R.C. Cartridge fuses to B.S.88/1952. Appendix 'J' Dimensions.
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- ★ Removable front covers to simplify erection of conduits and connection of cables.
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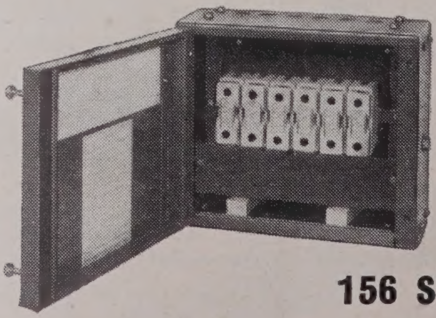
- ★ Heavy gauge sheet steel cases and covers, rustproofed and durably finished in light grey stove enamel.

All these and many other features.



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Because there are NO BRUSHES to inspect and renew
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Because there is NO COMMUTATOR to be skimmed
Because there is NO ROUTINE MAINTENANCE except bearing checks
Because all this drastically cuts maintenance costs

That's why shipowners are installing AEI **BRUSHLESS** alternators

AEI *Brushless* high-speed marine alternators cut maintenance costs, reduce shut-downs and save space. They can be supplied in ratings up to 1,750 kW. A transistorised voltage-trimmer gives good steady-load voltage regulation and high speed of response.

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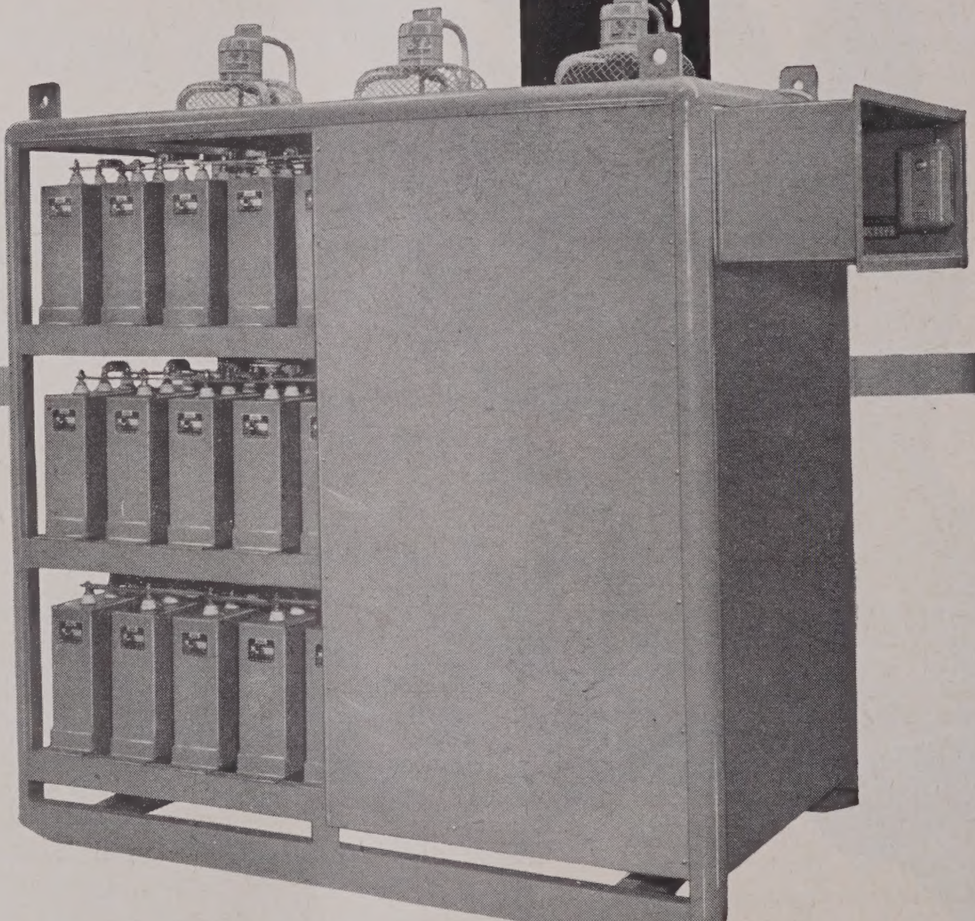
RUGBY AND MANCHESTER, ENGLAND

A5434

Power Costs Effectively Reduced—by HUNTS CAPACITORS



This Hunts Therminol Capacitor Bank for Power Factor Improvement was exhibited at the Electrical Engineers Exhibition.

Specification
950 kVAr 380 volts
3 Phase 50 cycles
Assembled with HRC fused Therminol capacitor units of 25 kVAr

Conditions vary between different areas and from one type of installation to another and you are invited to discuss your electrical power installation with our technical staff. Free advice and if necessary a report and estimate will enable you to judge whether the conditions of power consumption in your plant are needlessly wasteful. Anticipated annual savings sometimes running into many hundreds of pounds will show just how soon the capital outlay is recovered by the increase in electrical efficiency. Thereafter you will enjoy a net saving through reduced electricity costs.

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THE TRADE MARK OF RELIABILITY

We manufacture wide ranges of capacitors for other industrial applications including Phase Splitting, Fluorescent Lighting, Motor Starting and Running, HF and RF Heating, Radio Transmission, Telephone Installations, Ignition and Interference Suppression.

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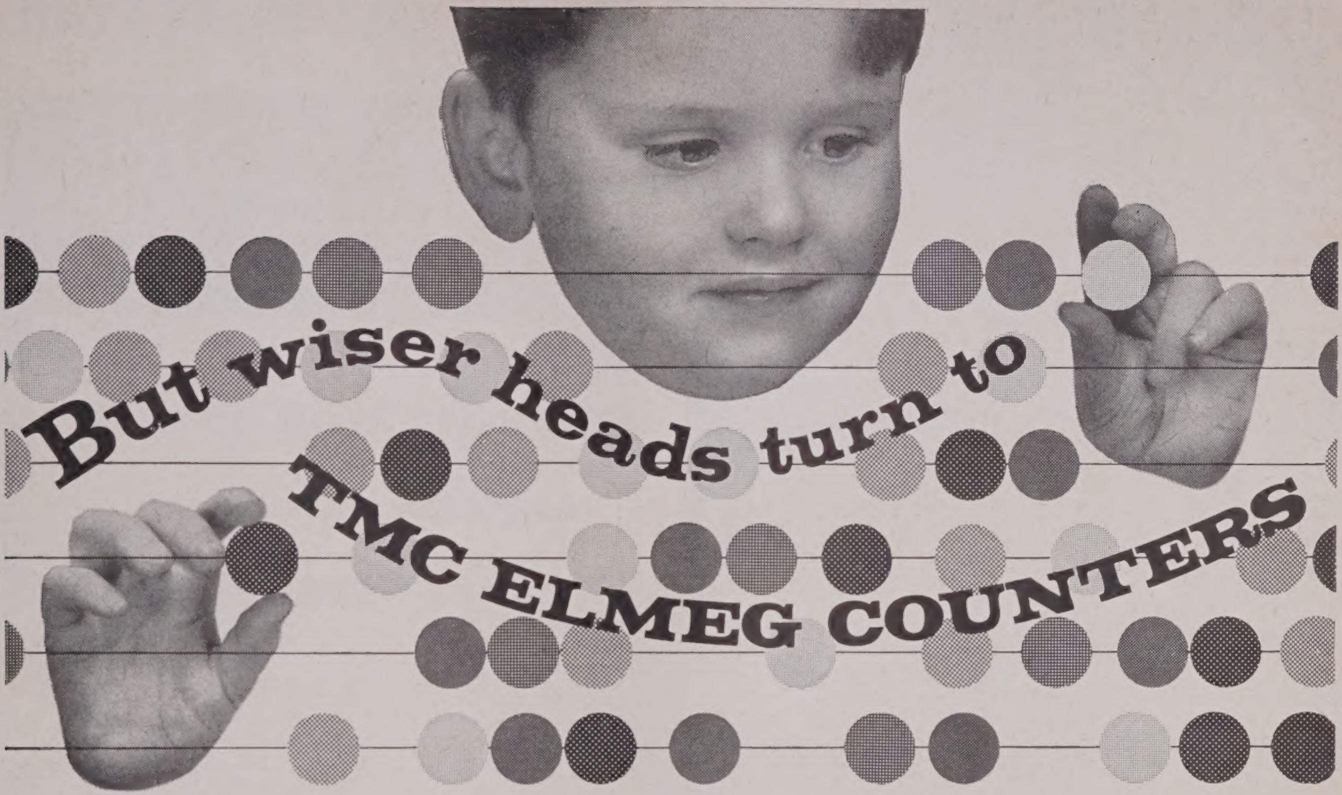
Head Office: Bendon Valley, Garratt Lane, Wandsworth, London, S.W.18
Factories also in Essex and North Wales


But wiser heads turn to
TMC ELMEG COUNTERS

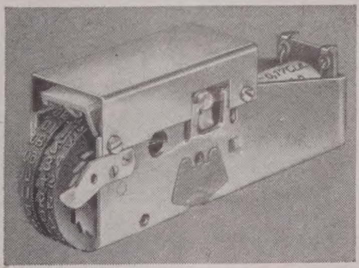
the new range with extensive applications and utmost reliability

including some counters of extreme compactness!

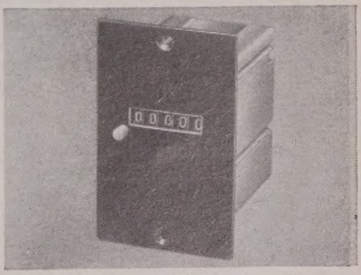
TMC Elmeg Counters are as near perfect as they can be made by the human skills of technical experts with years of experience and the most advanced equipment at their disposal. As a range, they are exceptionally versatile — offering a choice which should match up to even the most remote requirements. Available in "Print-Out" and "Read-Out" form, they have fast operating speeds of up to 40 per second. They operate on up to 220 Volts, with uni-directional or bi-directional motions. Re-setting to zero by electrical, mechanical or electro-mechanical methods. There are auxiliary contacts operating on each revolution of a numbered wheel. The range includes counters for flush panel mounting and surface mounting. No special servicing is required.

The number of applications for which TMC Elmeg Counters can be used to advantage are far too many to list in detail. The following will act as a general guide:

- *In conjunction with proximity switches or photocell equipment on production flow lines.*
- *In factory statistical equipment.*
- *In factory process control.*
- *In computers and office accounting machines.*



ZDmh—An 0-24 hours printout counter for vertical mounting



PZ5elR — 5-digit counter with electrical and mechanical reset.

You can register up to 9,999,999 on TMC Elmeg counters

TMC

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CLASS 'B' AND CLASS 'F' ELECTRICAL INSULATION

"SILUMINITE"

REGD. TRADE MARK

SYNTHETIC RESIN BONDED ASBESTOS LAMINATES

Photograph by courtesy of J. H. Humphreys & Sons Ltd.

A typical application of Siluminite electrical laminates is this D.C. medium voltage switch, designed to control the circuit switching and high induced voltages of a magnetic chuck. The fixed and moving contacts are mounted on ½″ thick Siluminite Synthetic Resin Bonded Asbestos Paper Laminate, symbol number ELS. 8. Siluminite ELS. 8 is suitable for continuous operation at temperatures up to 160°C. (above Class F rating) and its inorganic asbestos laminates are virtually indestructible. These factors provide a greater margin of intrinsic safety against the effects of overheating and fire hazard than is possible with ordinary organic based laminates.

To meet varying electrical and mechanical conditions there are other Siluminite laminates with asbestos felt, or fabric fillers, and melamine or silicone bonding resins.

A quality product

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ELECTRICAL INSULATION DEPARTMENT
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the Engineer wants the best

the Buyer wants economy

BICC CABLES

keep them both happy

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BRITISH INSULATED CALLENDER'S CABLES LIMITED 21 BLOOMSBURY STREET LONDON WC1

Walsall

MINIATURE CIRCUIT BREAKERS & ISOLATING SWITCHES

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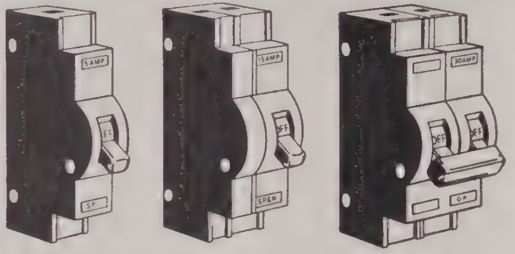
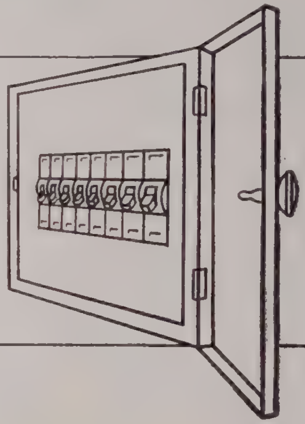
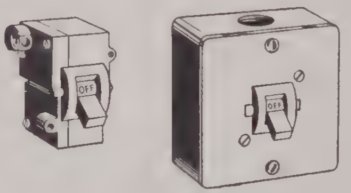


An entirely new and comprehensive range, adaptable to most industrial, commercial and domestic conditions.

440 Volts. A.C. only Ratings (Amps)-5-15-30-45-60



SERIES W



A range of units designed especially to fit the Standard B.S.S. 1299 Box.

250 Volts. A.C. Only. Ratings (Amps)-0.5-5-10-15

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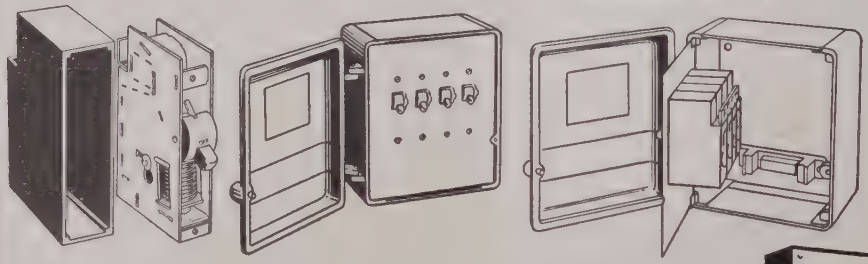

Single Pole units designed for distribution board assembly.

250 Volts. A.C. Only. Ratings (Amps)-7.5/4.5 - 15/10 - 22.5/17.5 - 30/25-40-50

Every day more and more demands are made upon electrical power and this ever-increasing flow necessitates greater control and protection. The most reliable method of achieving this is by the use of "WALSALL" MINIATURE CIRCUIT BREAKERS to replace conventional fuse units.

The MINIATURE CIRCUIT BREAKER is a circuit control switch and protective device combined.

HAVE YOU THE LATEST "WALSALL" CATALOGUE? SEND THIS COUPON NOW!

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Two New Water Heater Control Switches

Volex

D.P. INSULATED
SWITCHES
WITH EARTH TERMINAL

WITH SELF-CONTAINED
MOUNTING BLOCKS

20 AMP. A.C.

V/5303	Without Pilot light ...		6/8d.	each
V/5303CR	„ „	Cream	7/8d.	„
V/5304	With Pilot light		9/-	„
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30 AMP. A.C.

V/5203	Without Pilot light ...		7/8d.	each
V/5203CR	„ „	Cream	8/8d.	„
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20 Amp. and 30 Amp.
SURFACE MOUNTING
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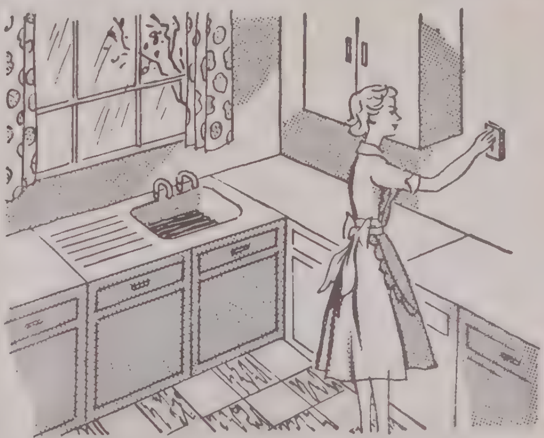

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atlas reduce prices

# of atlantic range

Prices of the entire family of over 150 Atlas Atlantic fluorescent fittings are down, some by as much as 8%! A few examples only are shown but full details are available on request.

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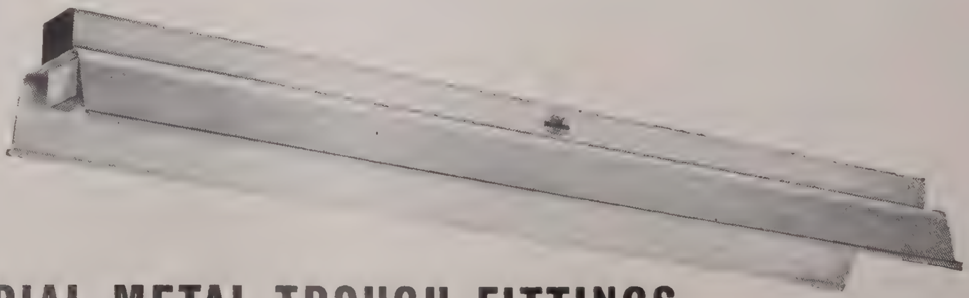

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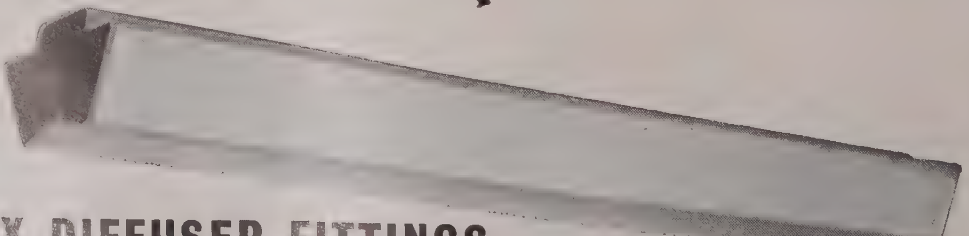

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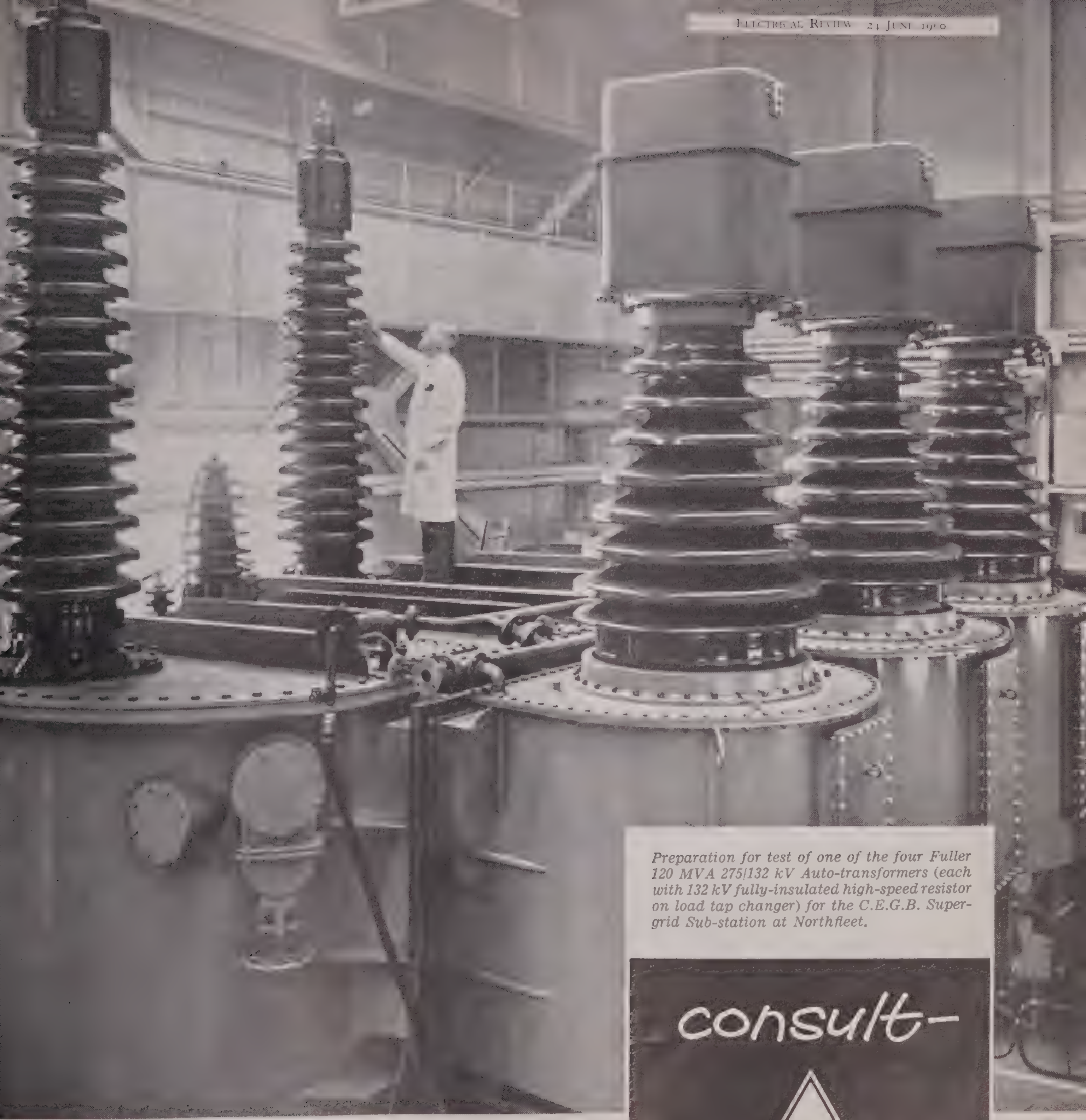

Preparation for test of one of the four Fuller 120 MVA 275/132 kV Auto-transformers (each with 132 kV fully-insulated high-speed resistor on load tap changer) for the C.E.G.B. Supergrid Sub-station at Northfleet.

consult-

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Modern plant and 40 years' experience ensure that we are particularly well-equipped to manufacture transformers up to the largest sizes and the highest voltages. Thanks to our long association with Asea of Sweden, we have access to an unrivalled experience of 380 kV practice. Our up-to-date equipment includes a vacuum drying chamber with a capacity of 7,000 cubic feet suitable for the treatment of the largest units.

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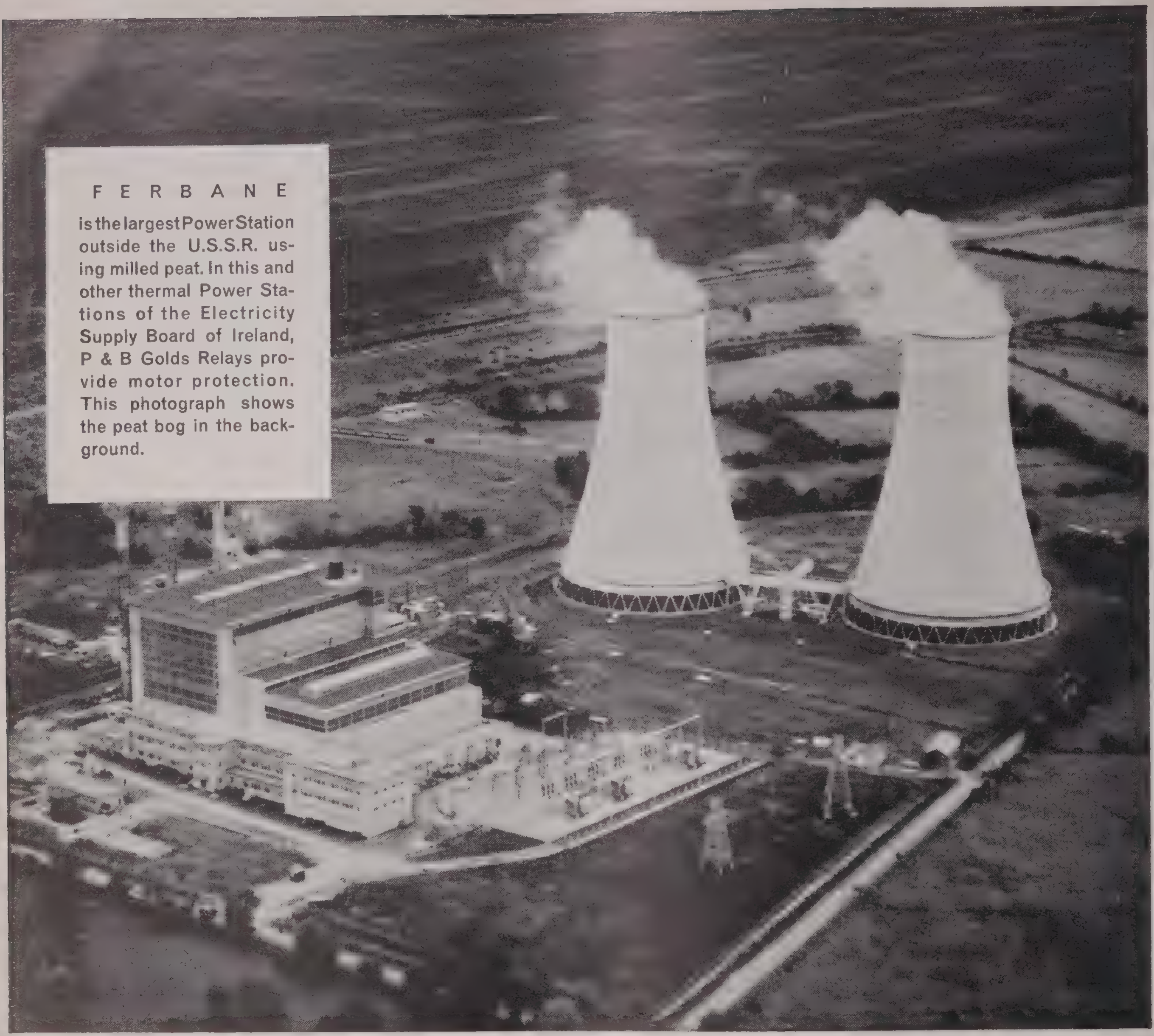
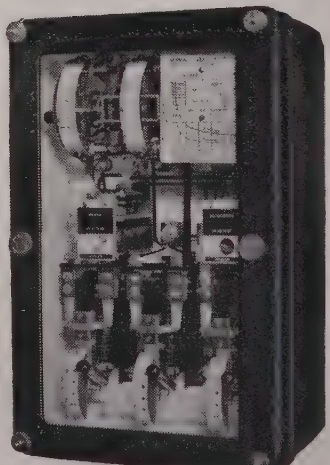


FERBANE

is the largest Power Station outside the U.S.S.R. using milled peat. In this and other thermal Power Stations of the Electricity Supply Board of Ireland, P & B Golds Relays provide motor protection. This photograph shows the peat bog in the background.

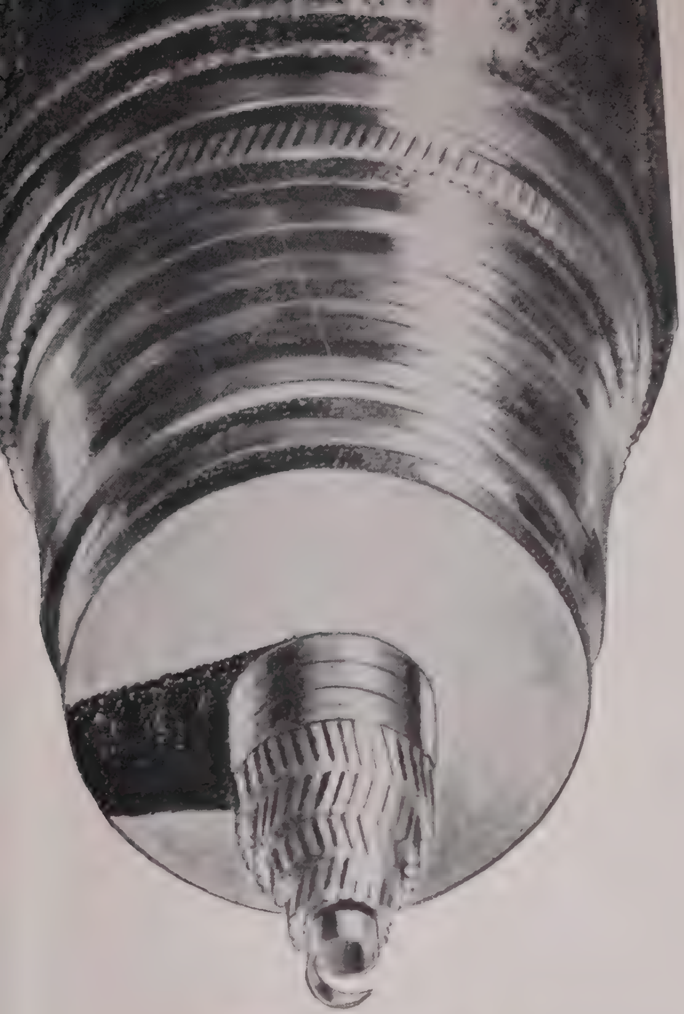
BORD SOLATHAIR AN LEICTREACHAIS
choose P&B Golds Relays

P & B Relays give full protection for motors with any starting periods or currents under extremes of ambient temperature.
P & B Golds Relays protect against phase failure, overload, short circuit or earth fault.
P & B Stalling Relays give complete protection against stalling under all conditions. Send for current literature.



P&B
PROTECTION RELAYS

THE P & B ENGINEERING CO. LTD
CROMPTON WAY
CRAWLEY · SUSSEX
Telephone Crawley 1004



Ascending a 540 foot vertical shaft in the rock, twelve single-core 330,000 volt oil-filled cables link the Kariba power station with the transmission lines above.

To overcome installation difficulties each cable was produced in a continuous unjointed length, the longest being 665 yards. Total length of 330,000 volt cable supplied —6,718 yards.

These cables, operating at the highest voltage in Africa, were designed, manufactured and installed by the BICC Group.

The Electrical and Mechanical Consulting Engineers: Messrs. Merz & McLellan.

BICC 330,000 VOLT CABLES AT KARIBA

Fitting a high oil-pressure cable-end cap.

Installing a 330,000 volt cable termination.
(Copyright: Federal Power Board)

A length of 330,000 volt cable being drawn off the drum.

RITISH INSULATED CALLENDER'S CABLES LIMITED, 21 Bloomsbury Street, London, W.C.1

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USE
NECO
GEARED
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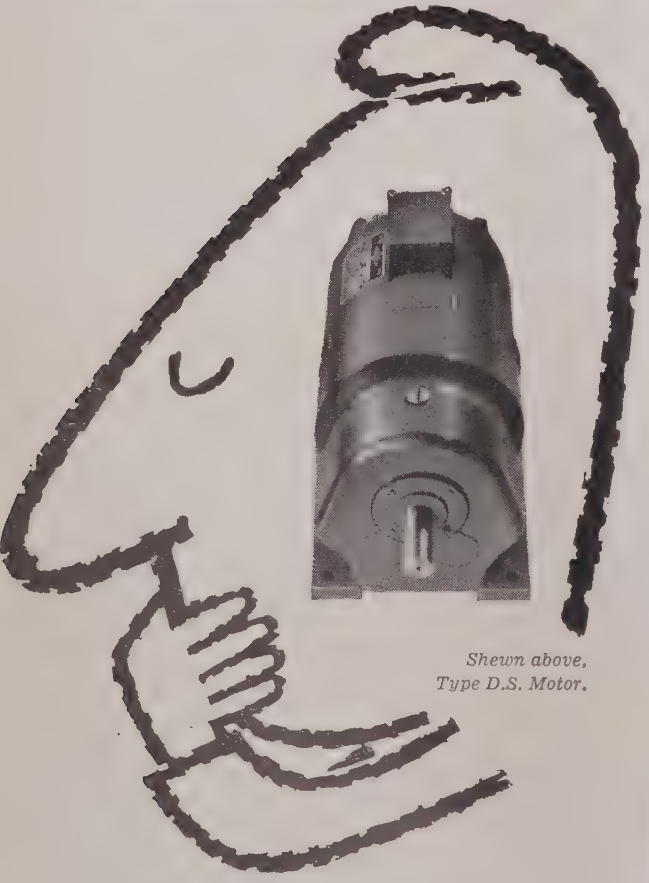

*Shewn above,
Type D.S. Motor.*

Because they can be made for mounting in any one position without delay in delivery.

$\frac{1}{8}$ to 2 H.P. 25 to 1500 lb. ft.

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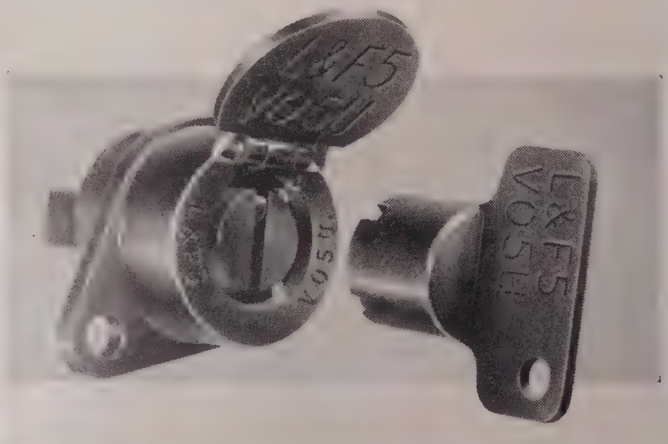
INTERLOCKS
assure correct sequence control and increase safety

- ★ VIRTUALLY UNLIMITED DIFFERS
- ★ POSITIVE LOCKING

A safety lock, approved by the Central Electricity Generating Board, and backed by 70 years of lock manufacturing experience.

The "Engineers Manual of Interlocks and Allied Locking Devices" gives details of design, dimensional drawings and ordering arrangements. *Please write for a copy.*

Our service includes the assistance of technical staff whenever and wherever required.



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WANDOVERPLAS Aluminium Overhead Cables
FLORAWARM Floor Heating Wires and Cables
HITEM High Temperature operating Thermo-plastic Cables
and a full range of all Domestic Wires and Cables
Also a complete range of PTFE insulated wires for operation up to 250° C.
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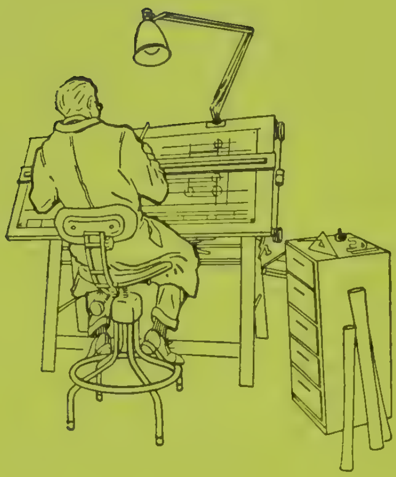
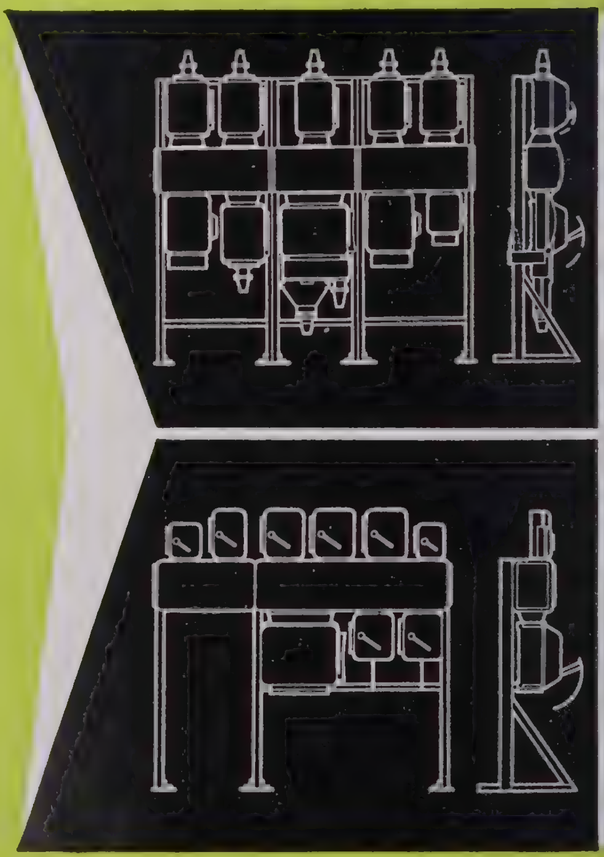
Simplex



Simplex Switchboards are versatile. They can be assembled with Simplex Star, Regent and Monarch ranges, and with the Simplex S & S automatic control gear, also circuit-breakers, etc., etc. Simplex planning is geared to to-morrow's needs.

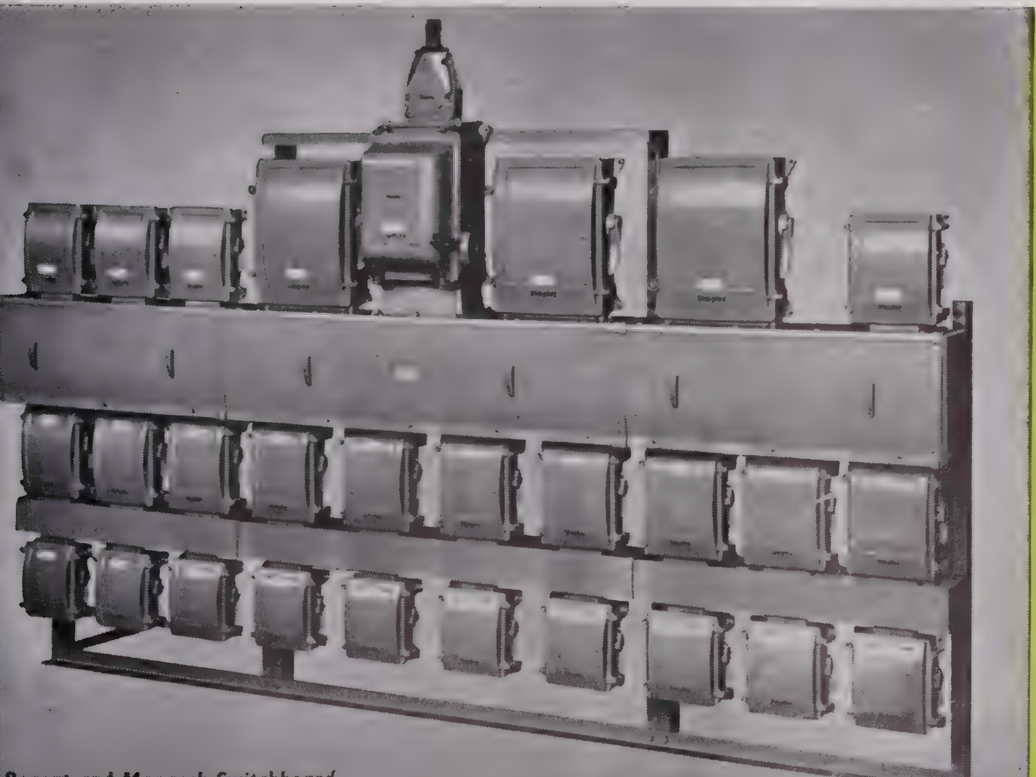
Simplex design service is at your disposal – always. From a simple assembly to the most complicated made-to-measure task. Simplex application and layout engineers can provide an ideal Switchboard for every industrial & commercial requirement.



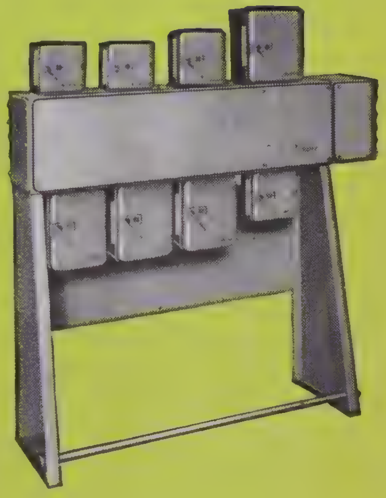
S.4

Switchboards

supplied with the brilliant new low-priced Simplex Star range, or the Simplex Regent and Monarch ranges of Switchgear, or the Simplex S & S automatic control gear, etc.



Regent and Monarch Switchboard designed to customers requirements.



Typical Simplex Star Switchboard. Send for the descriptive booklet on this brilliant new range.

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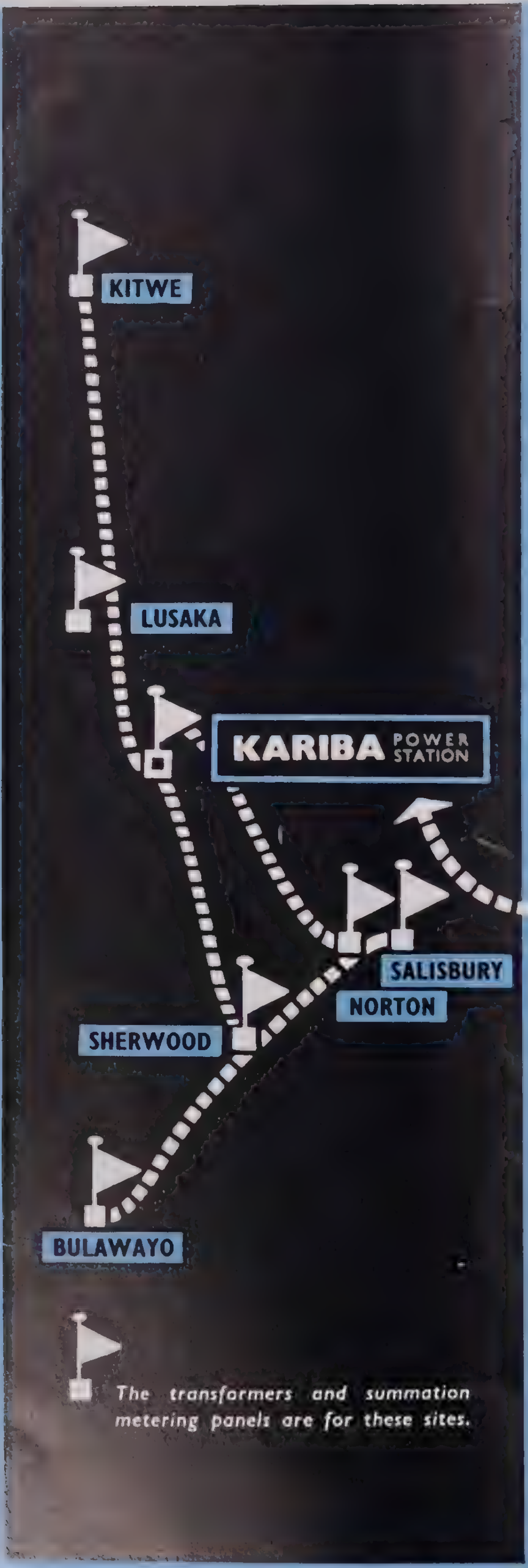
Branches throughout Great Britain and Agents throughout the World.



The transformers and summation metering panels are for these sites.

TRANSFORMERS

All the sub-station transformers for the Kariba Hydro-Electric Scheme are being supplied by Ferranti Ltd. They comprise two 120,000 kVA, 330/234 kV 3-phase auto transformers with series boosters, eight 60,000 kVA, 330/88 kV and four 60,000 kVA, 330/33 kV 3-phase double wound transformers. The transformer installations at Norton, Lusaka and Kitwe are complete. Work at Salisbury, Bulawayo and Sherwood is well advanced.

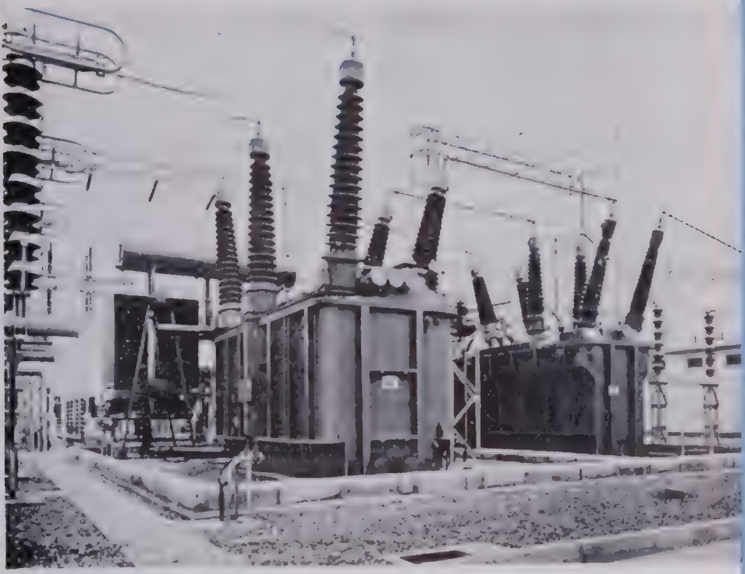
SUMMATION METERING

For the same scheme Ferranti Ltd. are supplying Summation Metering Equipment comprising: Precision grade integrating meters, Electro-mechanical summators, Printometer Demand Recorders and Suites of metering cubicles. These equipments will be used to meter six 100 MW generator sets at Kariba Power Station and also the supplies to the Transforming Stations at Kitwe, Norton, Salisbury, Lusaka, Sherwood and Bulawayo.

The consulting electrical and mechanical engineers are Messrs. Merz & McLellan.

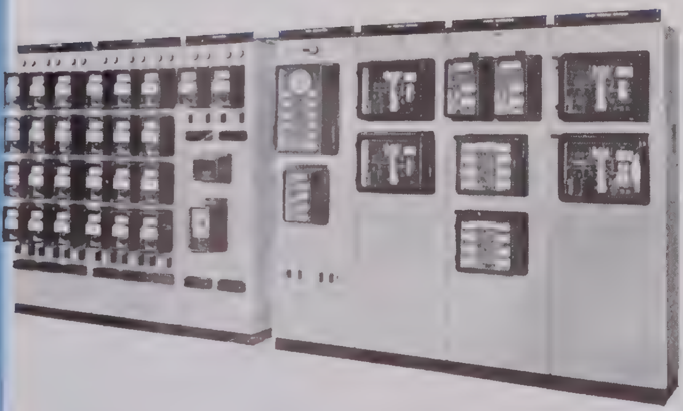
Ferranti

FERRANTI LTD · HOLLINWOOD · LANCASHIRE Tel: FAIlsworth 2000



One of the two Ferranti 120,000 kVA 330/234 kV auto transformer and series booster installations at the Kitwe sub-station.

FERRANTI AT KARIBA

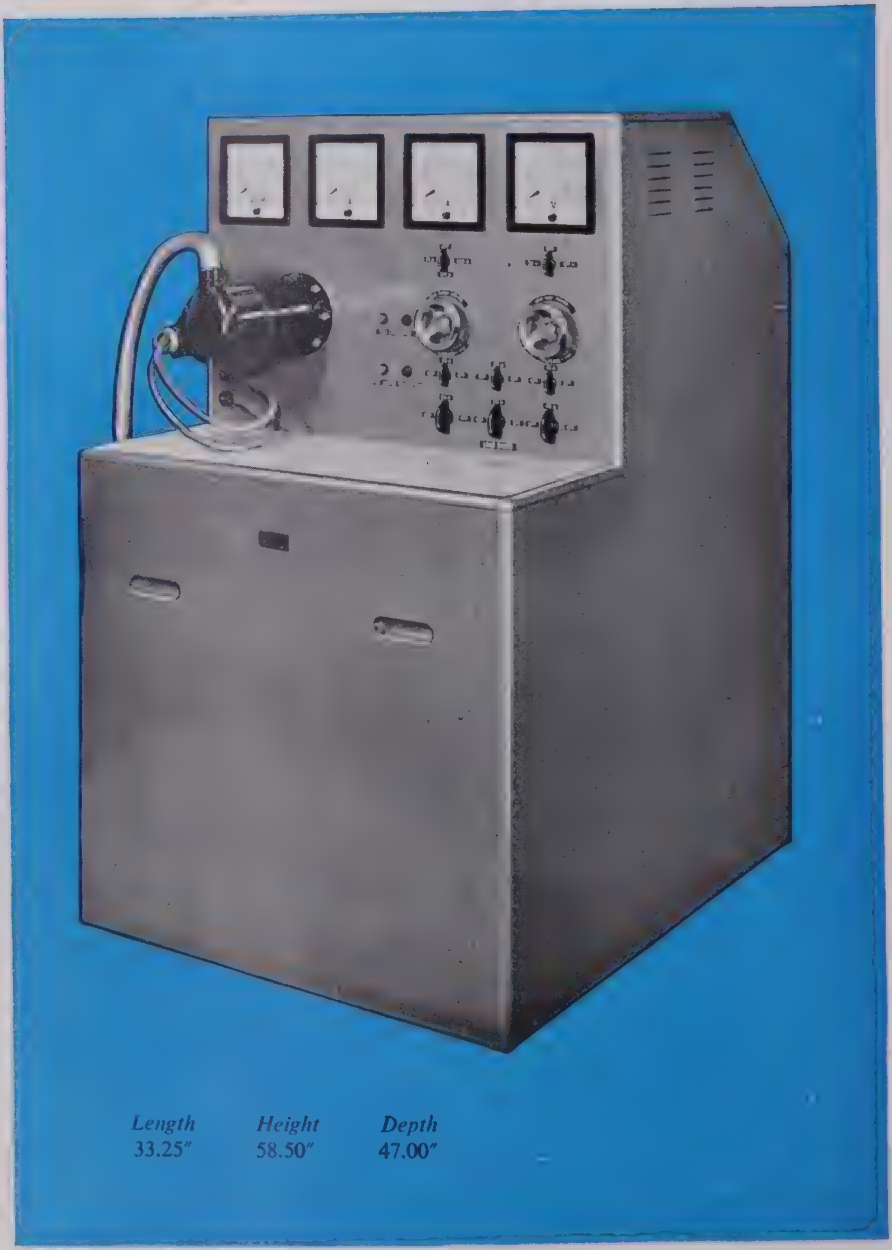


Ferranti Summation Metering Panels for the Kariba Power Station.

London Office: KERN HOUSE · 36 KINGSWAY · W.C.2 Tel: TEMple Bar 6666

FG 308/2

ROTAX TEST STAND FOR A.C. AND D.C. GENERATORS



Length	*Height*	*Depth*
33.25″	58.50″	47.00″

The test stand shown gives precision test results on alternators up to 15 kVA, or D.C. generators up to 9 kW, over a speed range of 2,500 to 10,000 r.p.m. It can be supplied as a combined unit, with full instrumentation for testing both alternators and generators. With pressure gauges and flow indicators fitted, it is suitable for testing pumps, compressors and other hydraulic units.

- Unit to be tested, conveniently sited for observation whilst running.
- Test stand supplied complete with load banks and an air supply for cooling unit under test.
- Steel cabinet with hammered finish. Colour as required.

BIG RANGE . . . COMPLETE SERVICE

Rotax have developed a range of test stands for all types of generators and alternators and one should suit your needs. If you require a more specialised instrument Rotax engineers will be glad to advise you. Write or telephone for further information.

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"but not WOOTTON METER BOARDS Sir"

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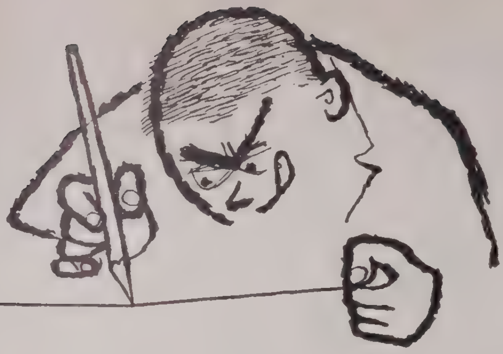

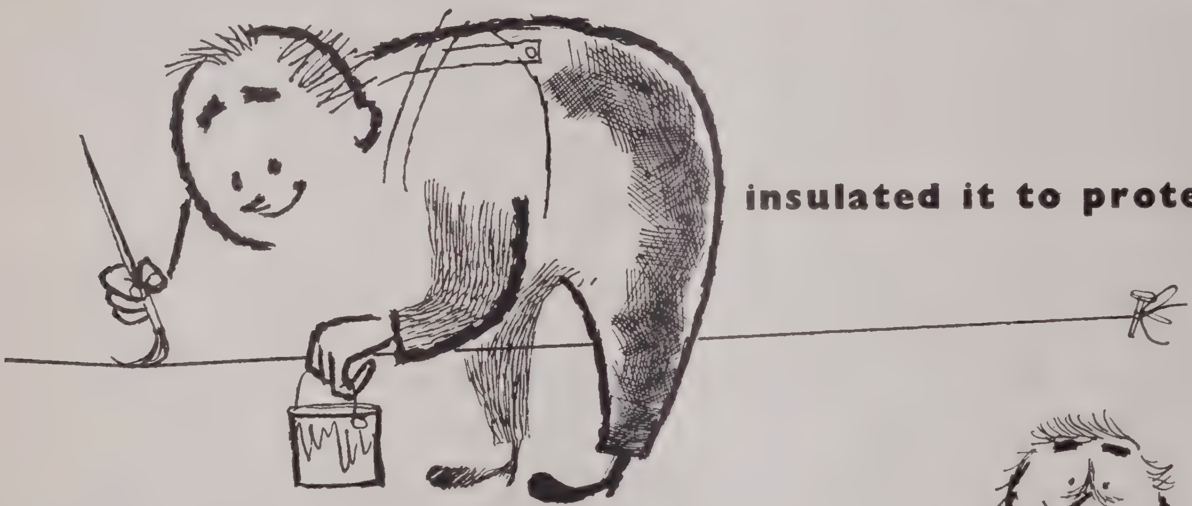

insulated it to protect it

and our booklet tells you all about

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Conymel, an all purpose vinyl acetal base winding wire, has been developed for many applications where toughness of insulation combined with flexibility and resistance to the solvents in impregnating varnishes is essential. Our latest Conymel catalogue gives all possible technical information on this type of wire, and will be of the utmost assistance to Designers and Coilwinders. A copy will gladly be sent free of charge on request.

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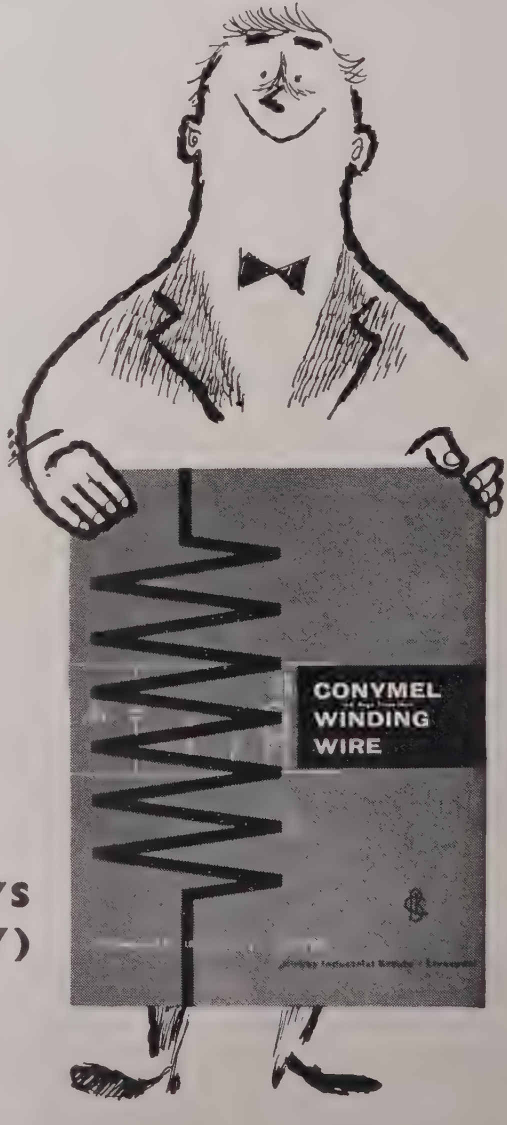
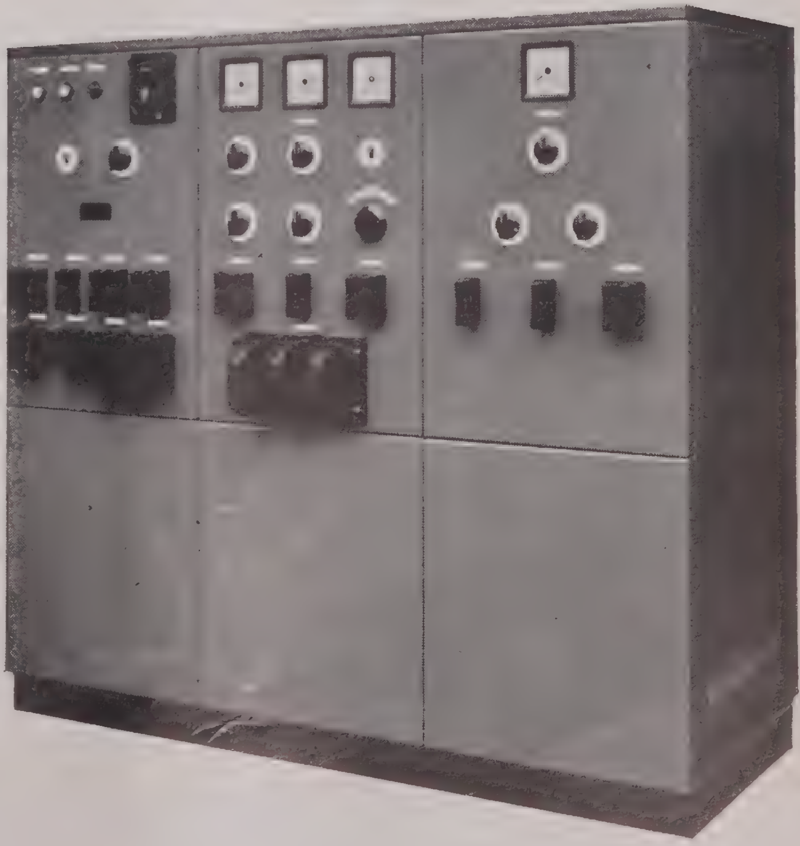


CW.9

Fast or slow

or a combination of both — Davenset Specialized design ensures the same perfect result—a safe charge. Whatever the application, Davenset Specialist engineers will produce the ideal circuit. That is why for more than 30 years, the leading battery makers have used Davenset Automatic or Manual Battery Chargers for utterly dependable installations in hospitals, cinemas, theatres, generating and sub-stations, ships, etc.



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Fork lift, tractors and electric delivery vehicles.

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Standby lighting, switchgear operating, alarm signalling and electric clock installations.

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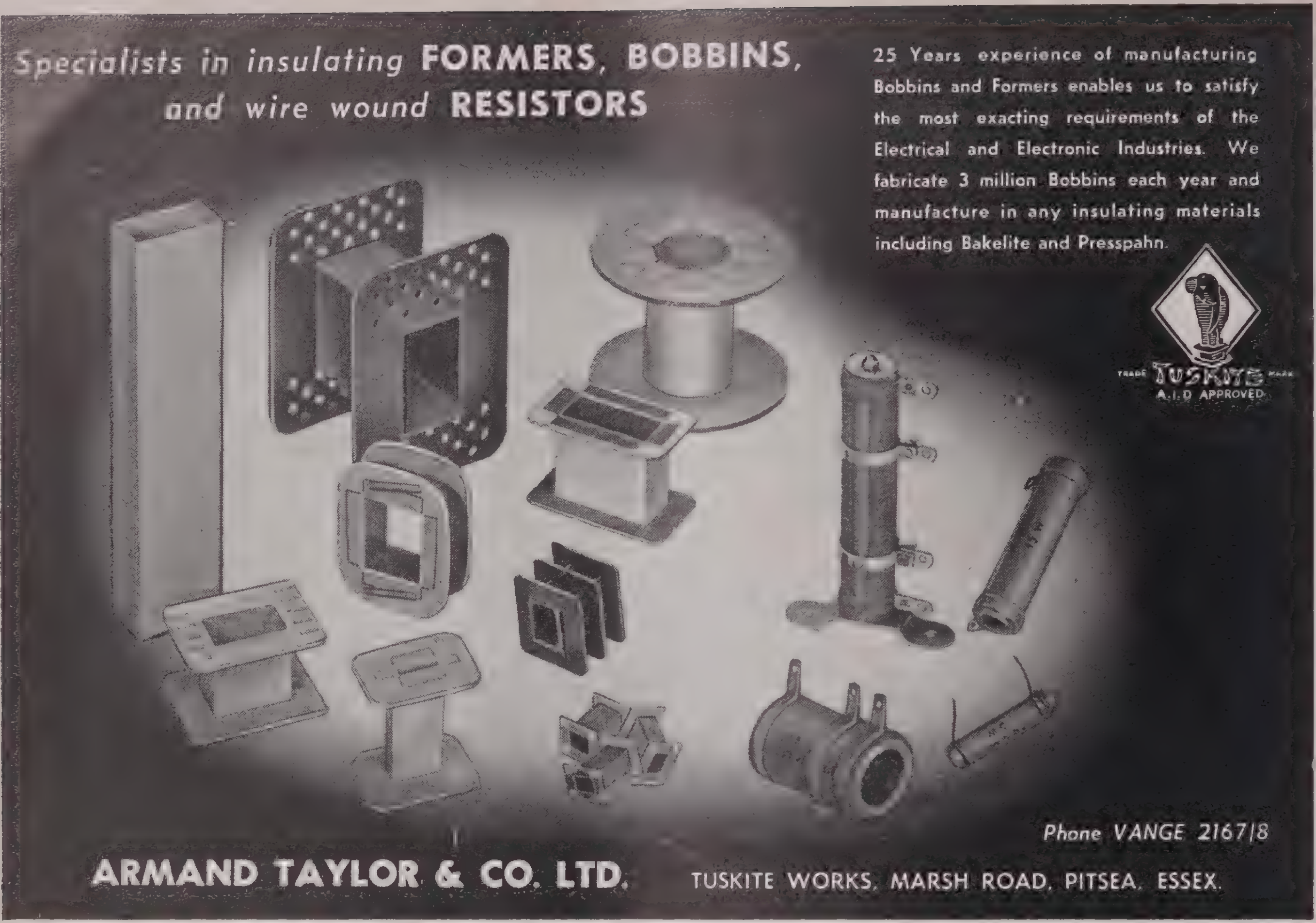

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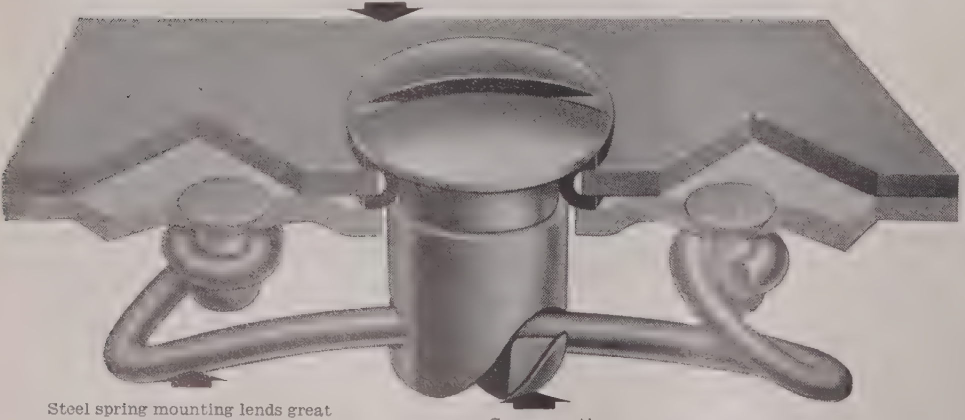
The locked position. The Dzus Fastener is instantly unlocked by a quarter turn anti-clockwise.



Steel spring mounting lends great strength and guards against loosening, however intense the vibration.

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- Dzus are fasteners with a world reputation for reliability. They can be fitted quite simply in any solid or laminated material regardless of thickness.
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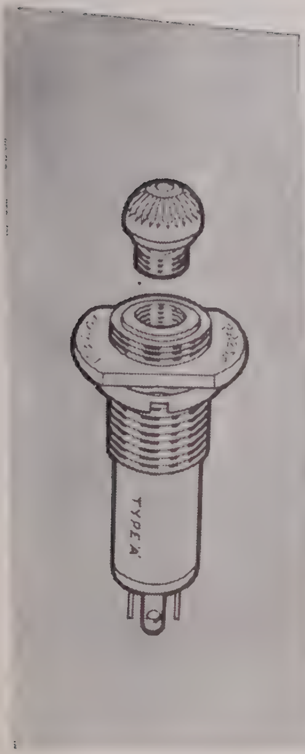
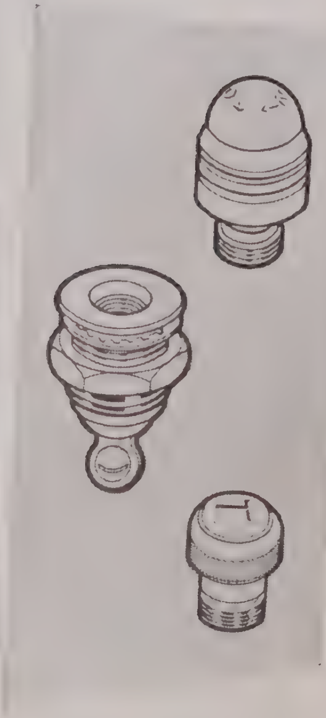
Sales Agents in U.K., Thomas P. Headland Ltd., Melon Road, Peckham, London, S.E.15.

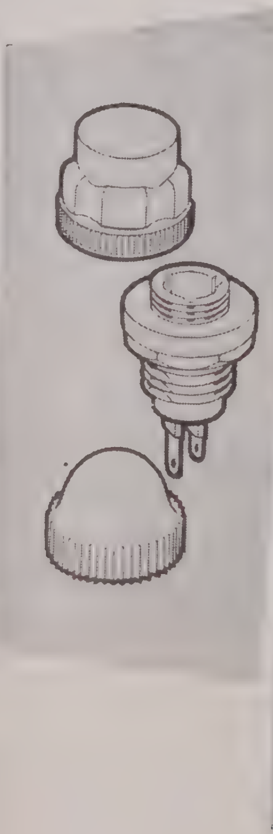
Thorn Miniature Indicator Lampholders the only range adaptable to one type of Service approved lamp!



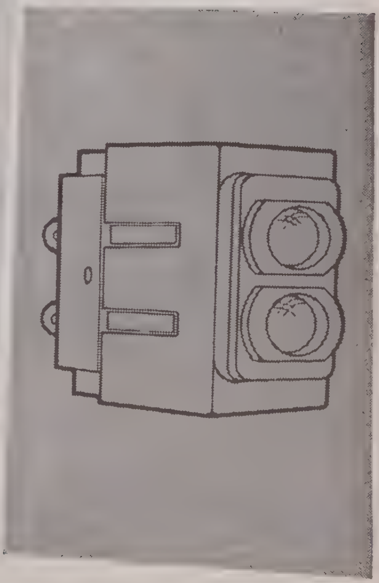
Press-to-test switches
Three or five-terminal versions available; the latter providing 34 circuit variations. Solder tag or screw terminals to choice. All bases will take dimmer, flat top indicator or indicator caps; full range of colours available. The switches are vibration-proof and maintain pre-determined contact pressures.



Indicator and Dimmer caps and bases
Inter-changeability between caps and bases provides maximum flexibility within the range. Wide variety of cap colours available; screw or solder terminals, panel return or insulated, to choice. Dimmer has metal rotary shutter with built in stops. Indicator caps are facet cut for maximum visibility. The Flat Top Indicator can carry an engraved legend.



Sealed Panel Lampholders
Designed to ensure reliability under severe conditions of service. Waterproof, fireproof and shockproof, they are primarily intended for aircraft, armoured vehicles and military equipment. Dimmer and Indicator Caps available in a wide range of colours. 2 pole lampholder body.



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For block indicator signs employing two lamps behind a translucent screen carrying the desired legend. Each unit will fit into a channel section mounting and any number may be stacked in this manner. 2 Pole Solder tag connections to each lamp position; lamp extraction facilitated by spring loading on individual collets. A 6-way version is also available.

This is the lamp... The Atlas Midget Panel Lamp...

only ·370″ long by ·182″ dia. rated at 6 volts ·06 amp.

(ACTUAL SIZE)
Available rated at 1·25, 4, 6, 12 and 28 volts.

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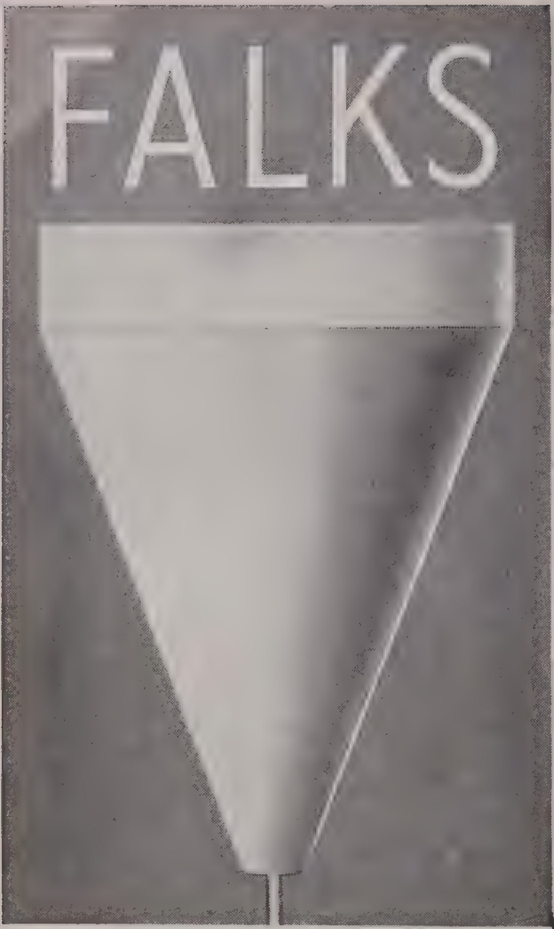


new "CORDCONE" ceiling switch

The 13 amp. 250 volt ceiling switch with full inductive rating. Available in single pole 1 and 2 way, double pole 1 way, with or without pilot light, brown or ivory.

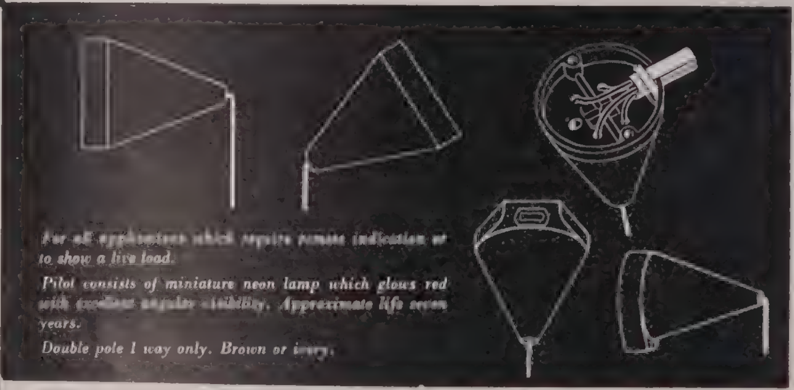
- ✳ *One rating only for domestic, commercial or industrial use, either lighting or power.*
- ✳ *Series break contacts particularly suitable for motor or fluorescent load. Will control up to thirty 80-watt fluorescent tubes and single phase motors up o ½ h.p. capacity.*
- ✳ *Single pole 1 or 2 way; double pole 1 way; 2 in. fixing centres.*
- ✳ *Double pole pattern available for bathroom fires.*
- ✳ *Easily replaceable cord.*
- ✳ *Completely insulated with no visible fixing screws.*
- ✳ *No dust traps.*
- ✳ *Ample cable stowage in base, terminals take 2×7/·029 cables.*
- ✳ *Conforms to B.S.2652 : 1955 for cord operated switches.*

Pattress available to assist compliance with 207G 13th Edition I.E.E. regulations. Pattress also supplied with integral looping in terminal.

Operates successfully with cord at any angle up to 90 from vertical.

✳ *Special cable clamp available for use with surface wiring. Surface knockouts are provided.*

"CORDCONE" *with pilot light*



For all applications which require remote indication or to show a live load.

Pilot consists of miniature neon lamp which glows red with excellent angular visibility. Approximate life seven years.

Double pole 1 way only. Brown or ivory.

and FALKS "FLEXCONE" *a matching ceiling rose*

Styled to match the "Cordcone" ceiling switch, to meet the requirements of modern installations. May be used without block or pattress.

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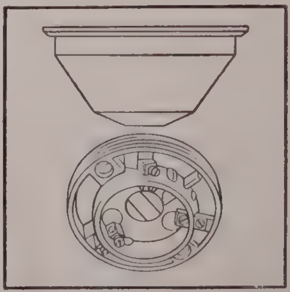
✳ *2 in. centre fixing with or without flange.* ✳ *A flange pattern for conduit box fixing or for covering rough ceiling holes.* ✳ *Angled terminals for easy wiring.* ✳ *Very effective cord grip.* ✳ *With closed back, hence needing no pattress.* ✳ *No visible fixing screws.* ✳ *Conforms to B.S.67:1938.* ✳ *Overall cover.*



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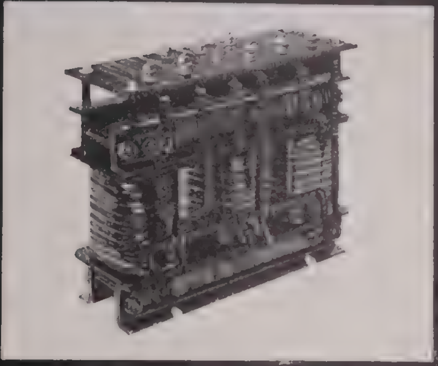

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DOUBLE WOUND
AUTO

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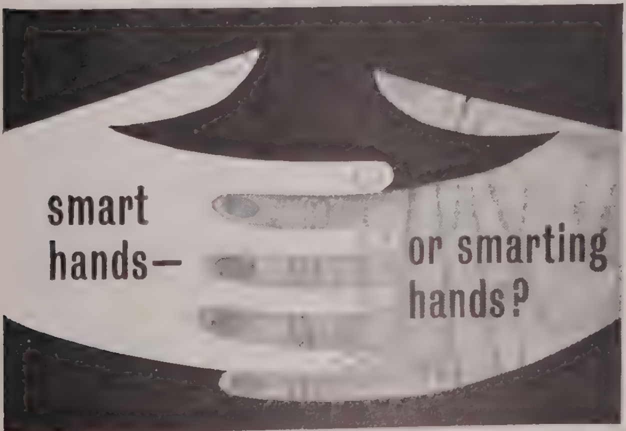
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Dermatitis hurts. Both hands *and* production suffer. The difference between smart hands and smarting hands is a Rozalex Barrier Cream. There is a range of these creams to provide protection against almost all known industrial irritants. Rozalex have been specialising in barrier creams for over 30 years. Their full technical resources are available from Rozalex Ltd., 10 Norfolk Street, Manchester 2.

ROZALEX BARRIER CREAMS protect

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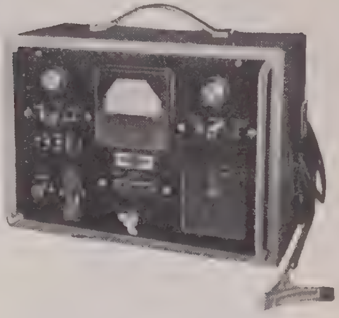

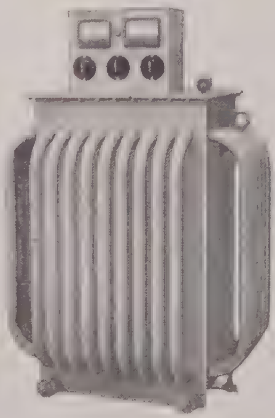

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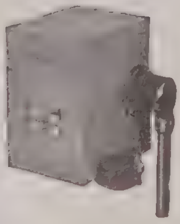

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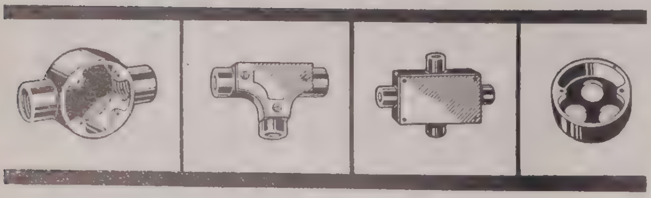

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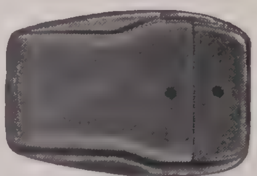

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These three names form the (N C S) trade mark that is famous throughout the electrical industry all over the world.

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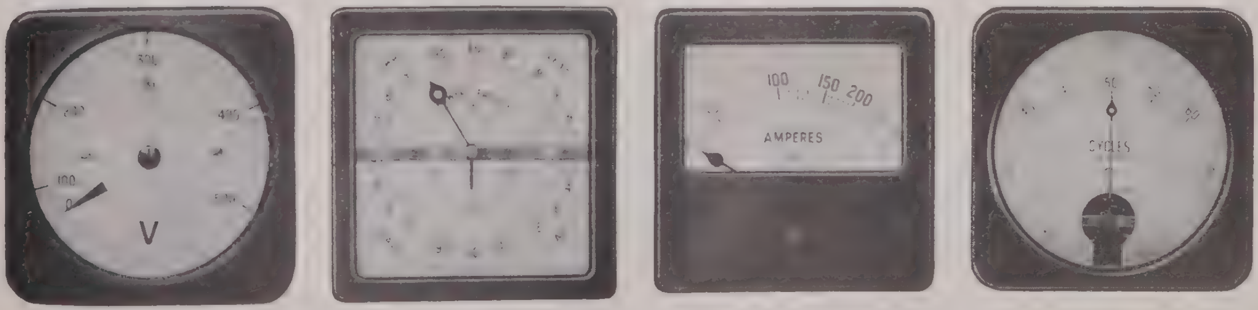

Nalders have 75 years of experience of making many types of electrical measuring instruments.

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Illustrated above:
Close up and general views of Hackbridge and Hewittic type PVB and RDB 33 kV isolators installed at Shepreth Substation, Eastern Electricity Board.

Illustrated right:
Hackbridge and Hewittic 25 kV on-off-earth rotating type isolators installed on the Colchester-Clacton-Walton Lines (British Railways Eastern Region)

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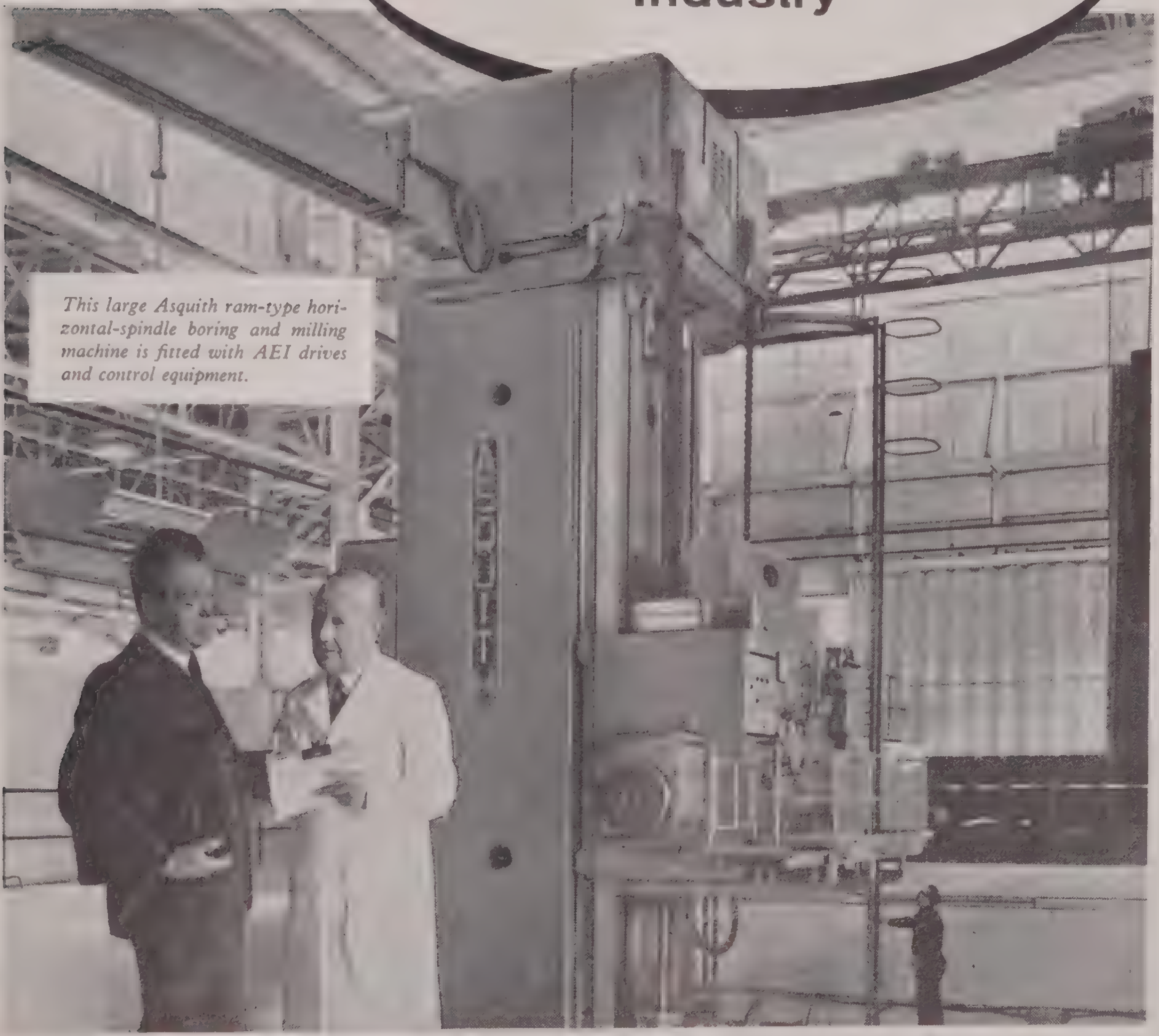

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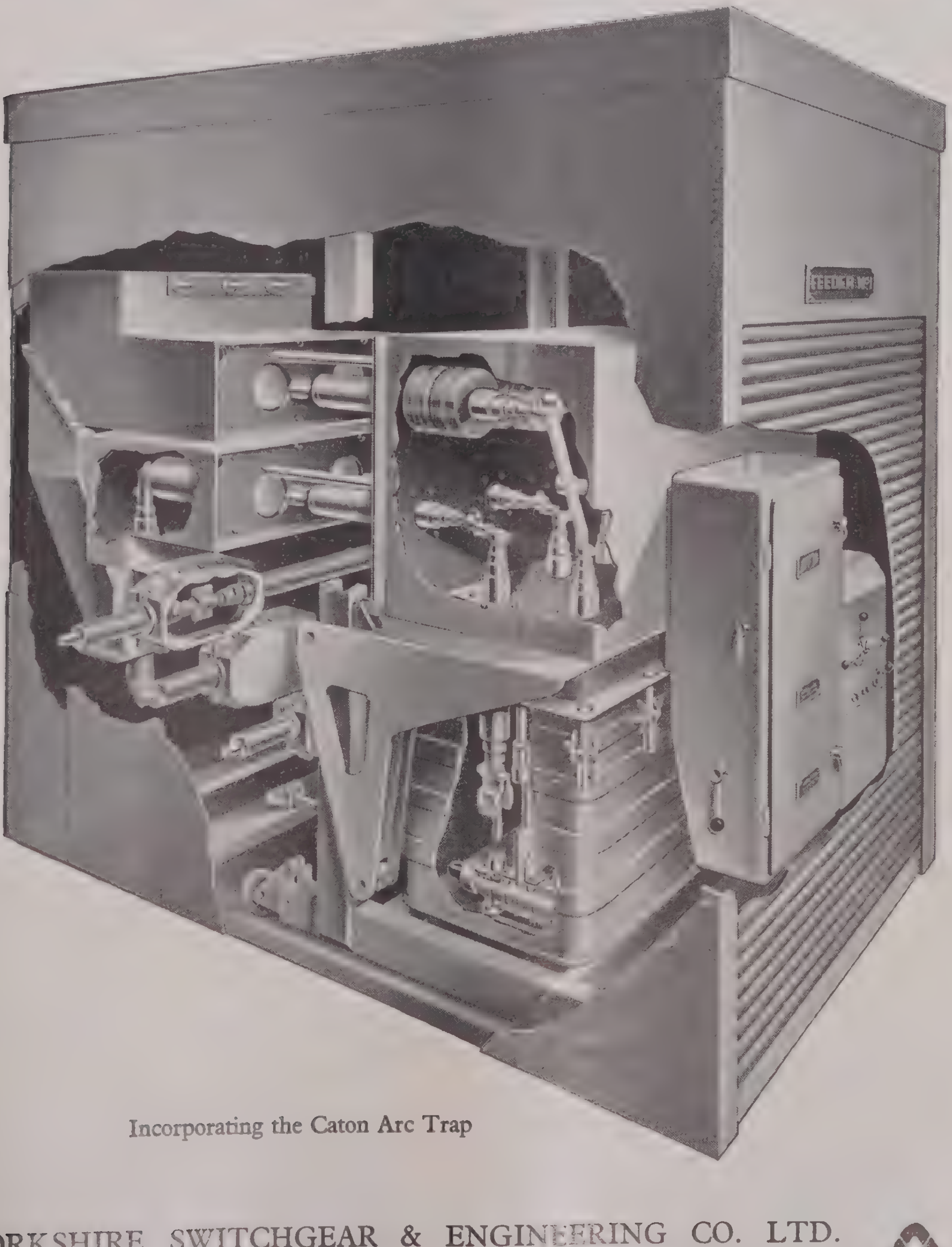

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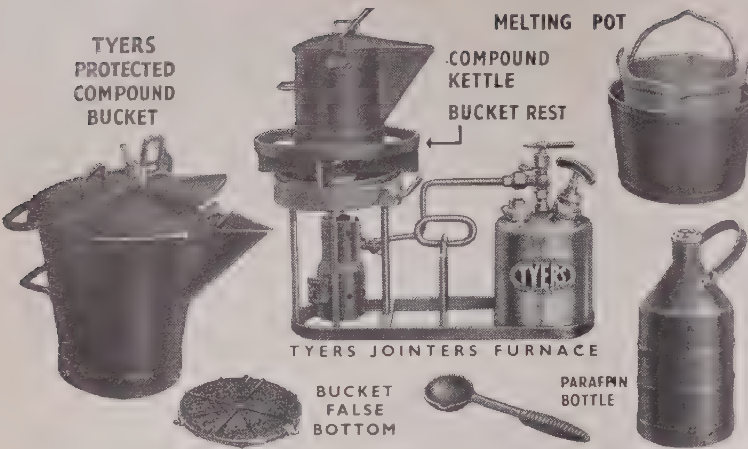

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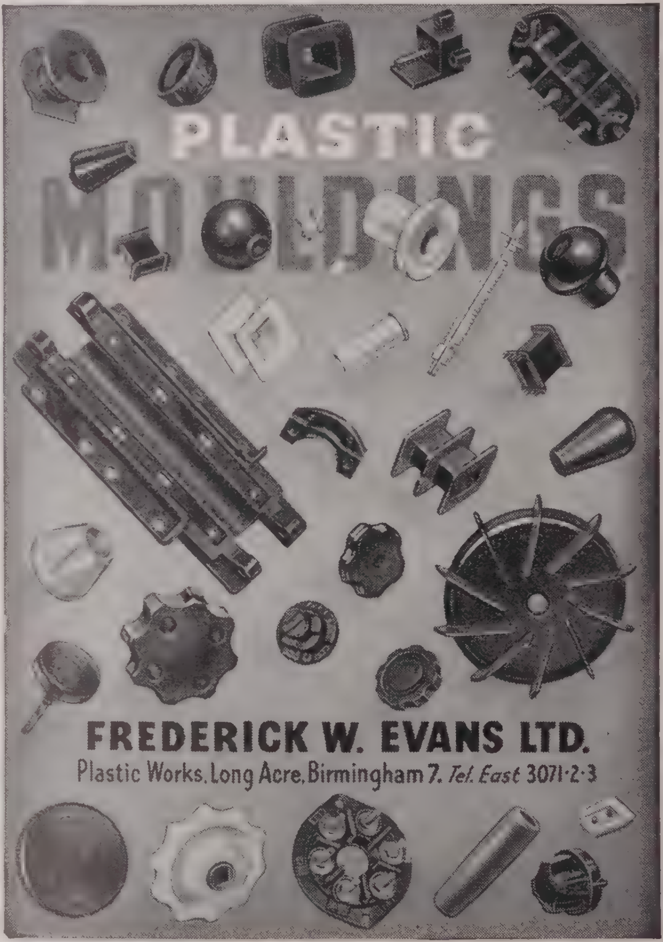

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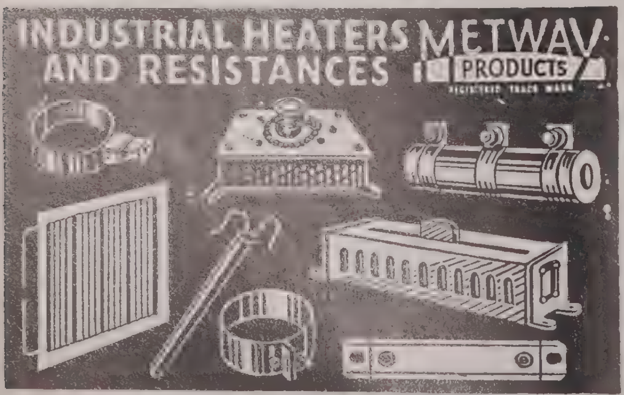

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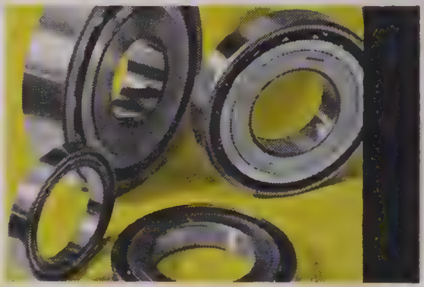

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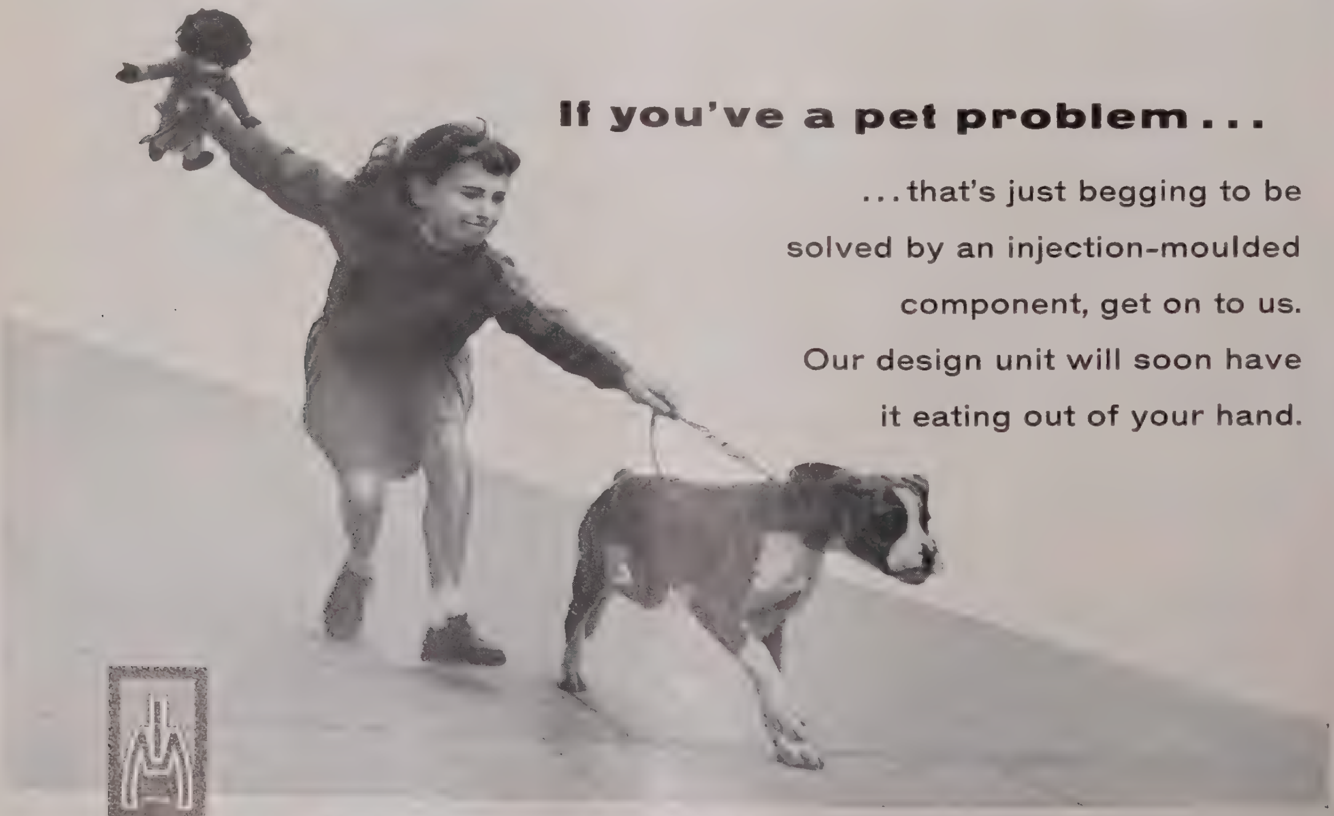

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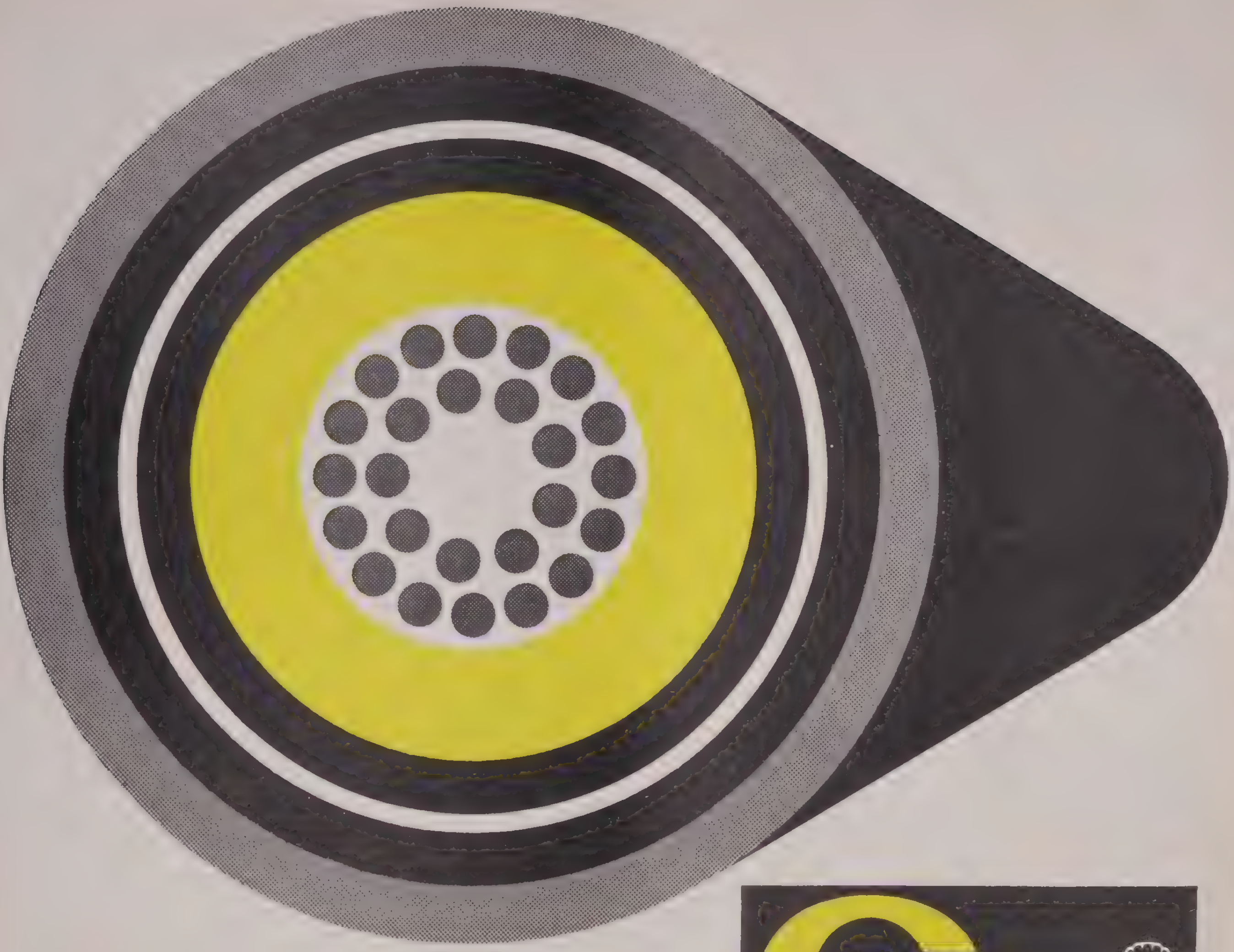

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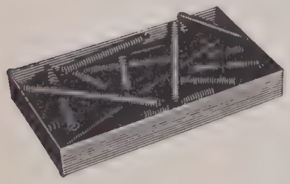

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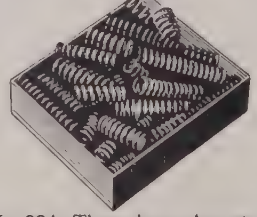

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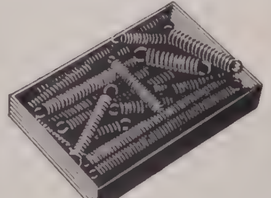

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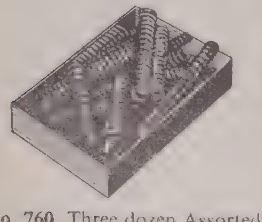

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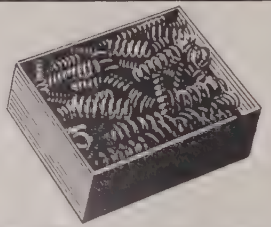
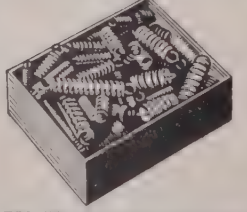


No. 757. Extra Light Compression, 1 gross Assorted, ⅛″ to 7/16″ diam., ½″ to 2½″ long, 27 to 19 S.W.G. 15/-.



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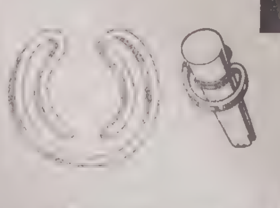

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NEOPRENE—a multi-purpose elastomer in manufacture since 1932

This elastomer has excellent resistance to oil, grease and most chemicals. It resists abrasion, cutting, chipping and flex cracking. In addition, it withstands sunlight, weathering and ozone.

Du Pont neoprene is ideal in cable jacketing, adhesives, colliery, conveyor and transmission belts, and in hose for oil and chemicals.

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Hypalon* is *completely* ozone-proof and is one of the few elastomers that can be compounded in an unlimited range of stable colours. It shows outstanding resistance to strong oxidising chemicals, such as concentrated sulphuric and chromic acids; and it withstands heat (at temperatures up to over 300°F.), abrasion, sunlight and weathering.

Du Pont Hypalon is ideal in coloured jacketing for wire and cable, coated fabrics, in protective and decorative coatings, for tank linings to hold oxidizing chemicals, hot materials belting, and white sidewalls for tyres.

VITON—a fluoroelastomer unsurpassed in fluid and heat resistance

This elastomer is unequalled for service in oils, solvents and chemicals at over 400°F., and resists most of the new fuels and lubricants used in jet aircraft. With its strong resistance to compression set, even at high temperatures, Viton* is ideal for gaskets subjected to heat.

Vulcanizates of Viton in any hardness of from 60 to 95 durometer, demonstrate a tensile strength, at room temperature, of up to 3000 psi., and ultimate elongation of up to 400%. Combining these properties with a high resistance to oxygen and weathering, Viton is an ideal material for precision seals, valve seats, diaphragms and coated fabrics.

In certain services, Viton has given satisfactory performance as low as —65°F.

	NEOPRENE	HYPALON	VITON
Hardness Range	40 to 95 Shore A	40 to 95 Shore A	60 to 95 Shore A
Tensile Strength	over 3000 psi	over 3000 psi	over 2000 psi
Temperature Range	-60°F. to +250°F.	-50°F. to +350°F.	-40°F. to 600°F.
Adhesion to Fabrics	Excellent	Good	Good to Excellent
Adhesion to Metals	Excellent	Excellent	Good to Excellent
Chemical Resistance	Good	Good to Excellent	Excellent
Compression Set Resistance	Fair to Good	Fair	Very Good
Ozone Resistance	Excellent	Outstanding	Outstanding
Flame Resistance	Good	[illegible]	Good
Sunlight and Weather Resistance	Very Good	Outstanding	Very Good
Abrasion Resistance	Excellent	[illegible]	Good
Oil Resistance	Good	Good to Excellent	Excellent

*Hypalon and Viton are both registered trade marks of Du Pont elastomers.

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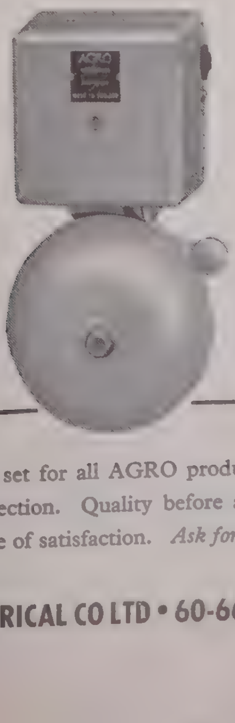

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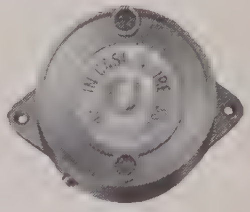

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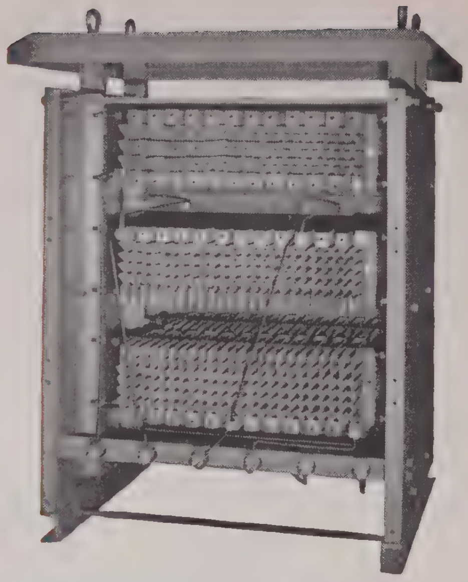

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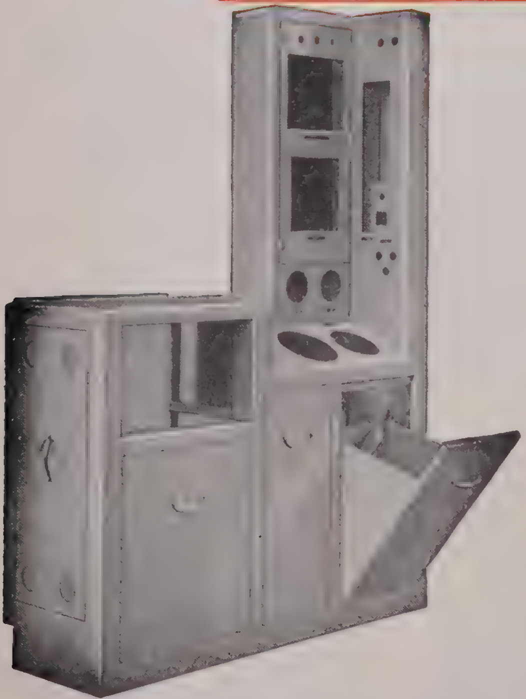

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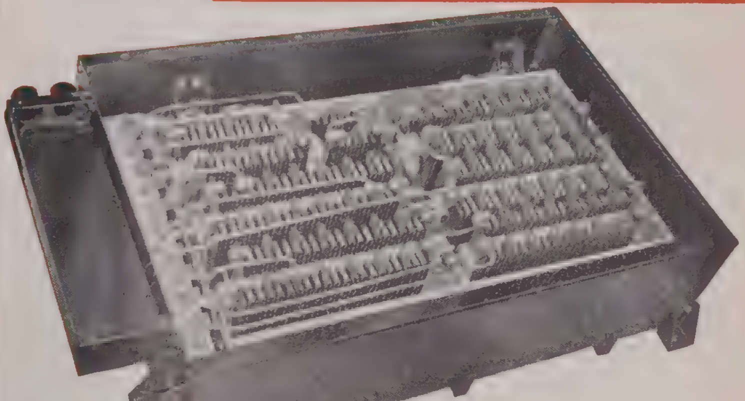

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S.L.162

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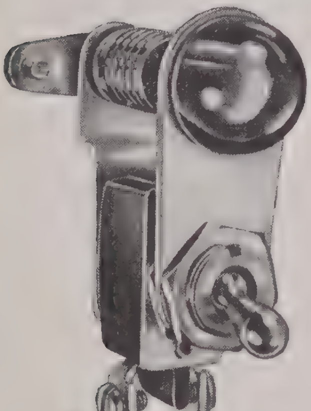
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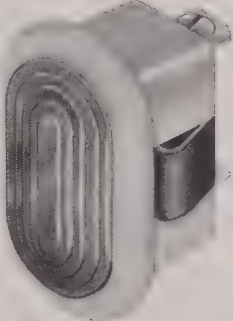
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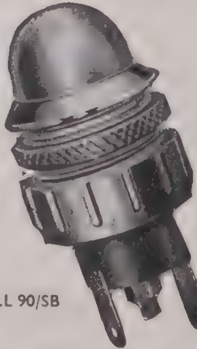
S.L.130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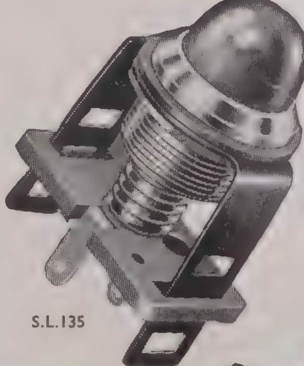
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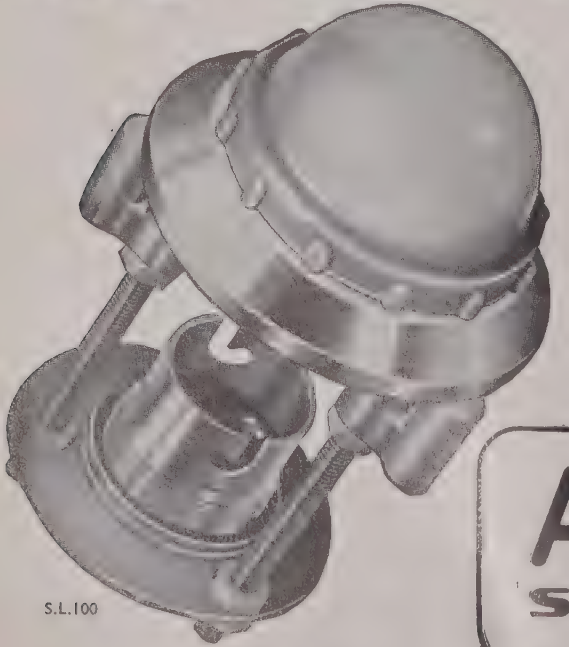
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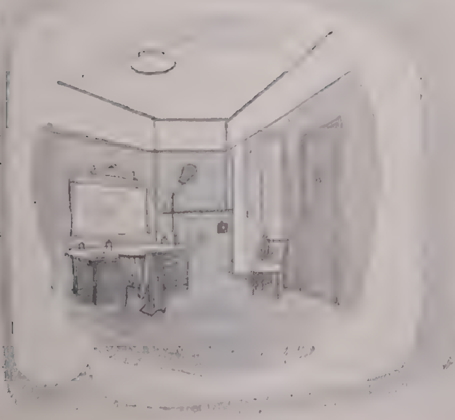

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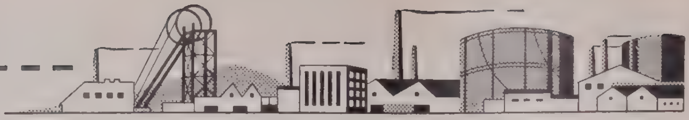

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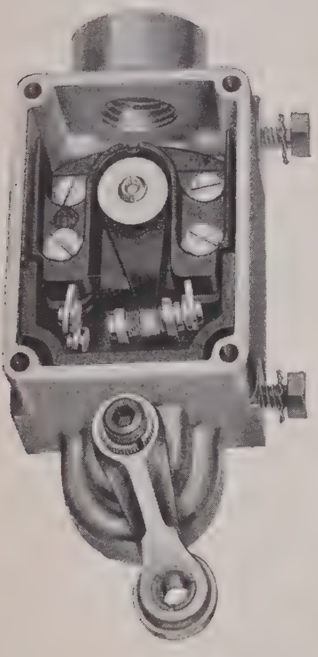
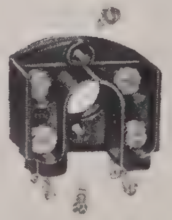
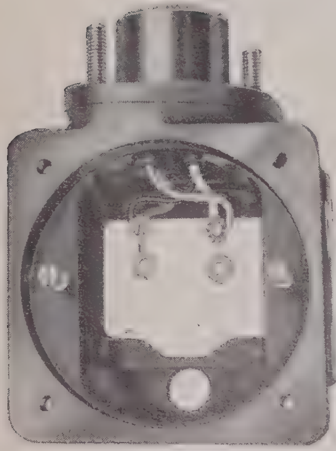


Two only replaceable assemblies in the electrical side: moulded one-piece contact block and arm. Interchangeable on all Mark II versions.





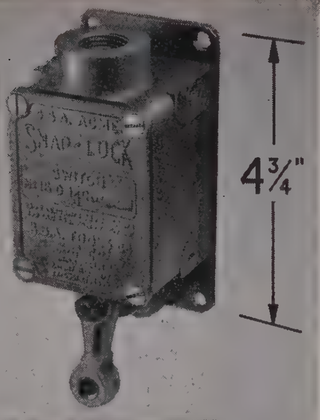
The mechanism of the Flameproof switch is easily removable as a unit for servicing.

Water Oil and Dustproof or Flameproof versions

Standard Neutral position or Centre connection

MARK II

B.S.A. SNAP-LOCK ACME



STANDARD

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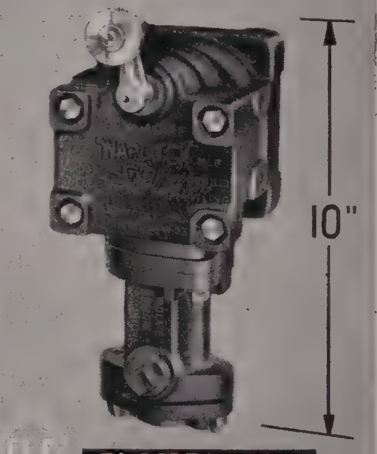
Single pole, double break, double throw, operates with either circuit normally open with other closed, or maintaining in either position, or available with central (neutral) position and/or centre connection. Heavy aluminium die-cast case. Conduit ½" B.S., or No. 3 Admiralty Pattern Cable gland entry. Two-screw side mounting or backplate mounting in two styles, or Tandem style (back to back mounting). Operating lever position adjustable in 7.5 deg. increments through 82.5 deg. either way from normal.



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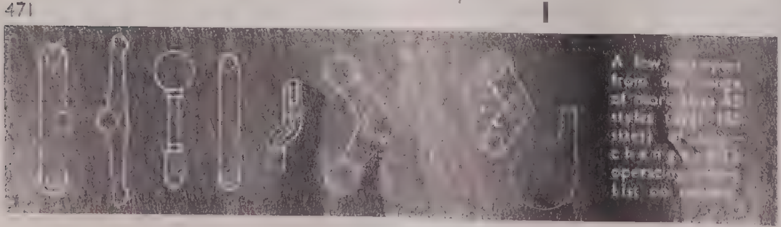

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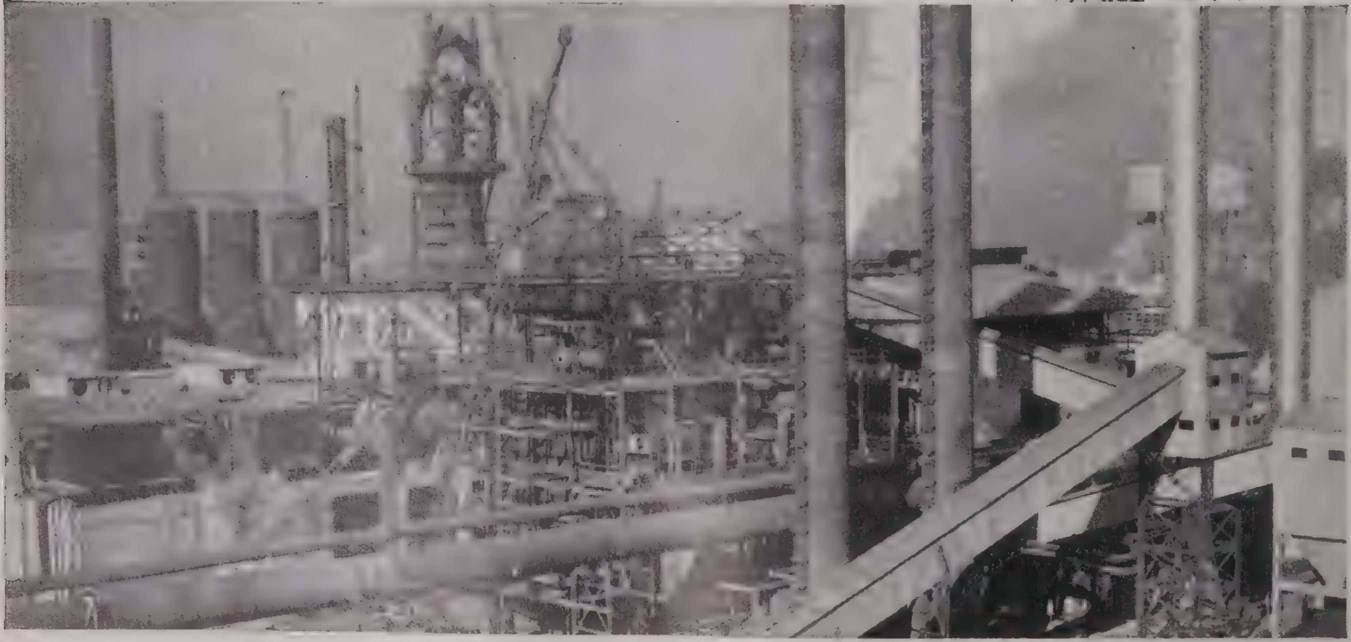

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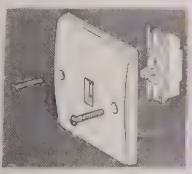

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3 DRIP-PROOF THREE-PHASE MOTORS
British Standards ½-175 hp. (List No. 101). New NEMA Dimensions ½-150 hp. (List No. 102).

4 DRIP-PROOF SINGLE-PHASE MOTORS
British or American Standards. New NEMA Dimensions ½-5 hp. (List No. 105).

5 VERTICAL HOLLOW & SOLID SHAFT DRIP-PROOF PUMP MOTORS
British or American Standards. NEMA Dimensions 10-300 hp. (List Nos. 602 & 604).

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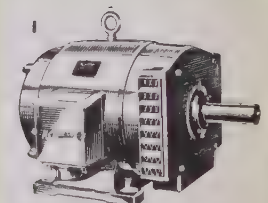
1



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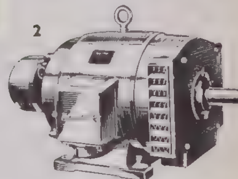

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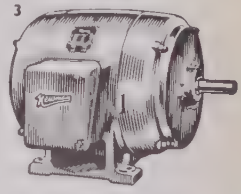

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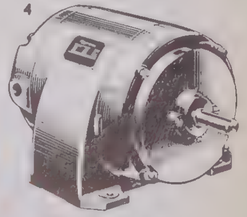

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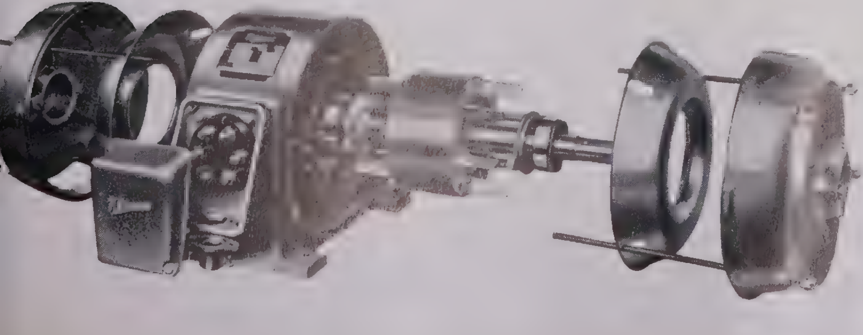

Drip-proof motors at work —

Two centrifuges at a Yorkshire colliery used for the dewatering of coal. The plant was supplied by Rheolaveur General Construction Limited and the 60 hp. Newman drip-proof motors are coupled to the plant through Vulcan-Sinclair fluid coupling units.

A screwing machine manufactured by Maiden & Co., Limited and powered by a Newman, British Standard drip-proof motor.

At a hardwood sawmill in Louisiana, U.S.A. this 100 hp. Newman drip-proof slip-ring motor powers a saw.

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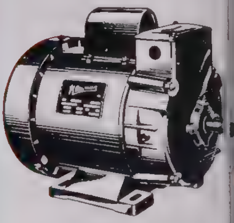
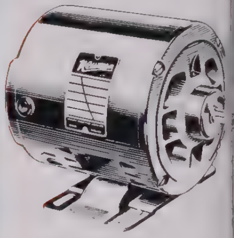
603 Cogent

THE NEWMAN RANGE

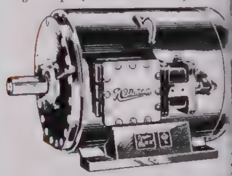
Some of the other typ of Newman motors available.



1 66-FRAME MOTORS
British or American Standards. NEMA Dimension ½-3 hp. (List No. 504).



2 STEEL FRAME FRACTIONAL HP. MOTORS
British or American Standards. NEMA Dimension ⅛-1 hp. (List No. 502).



3 FLAMEPROOF MOTO —STEEL FRAME
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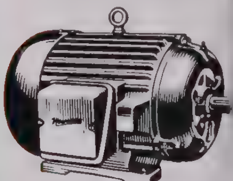
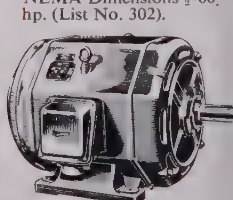
British Standards 5-200 hp (List No. 702). (Also availa to NEMA Dimensions.)



4 TOTALLY ENCLOSED THREE-PHASE MOTO
British Standard Dimensio ½-60 hp. (List No. 301). N NEMA Dimensions ½-60 hp. (List No. 302).



5 TOTALLY ENCLOSED MOTORS
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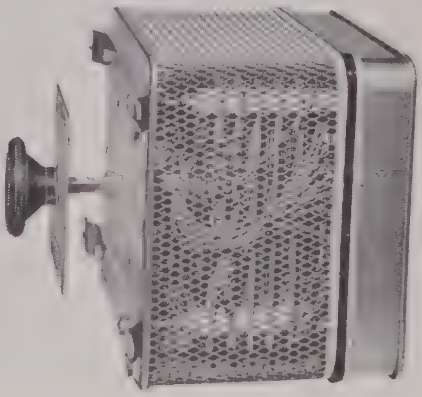

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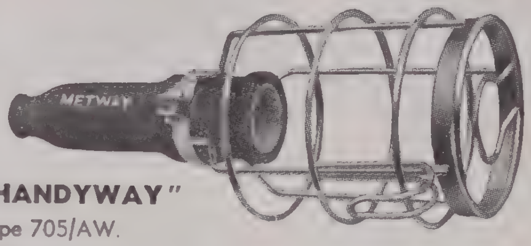

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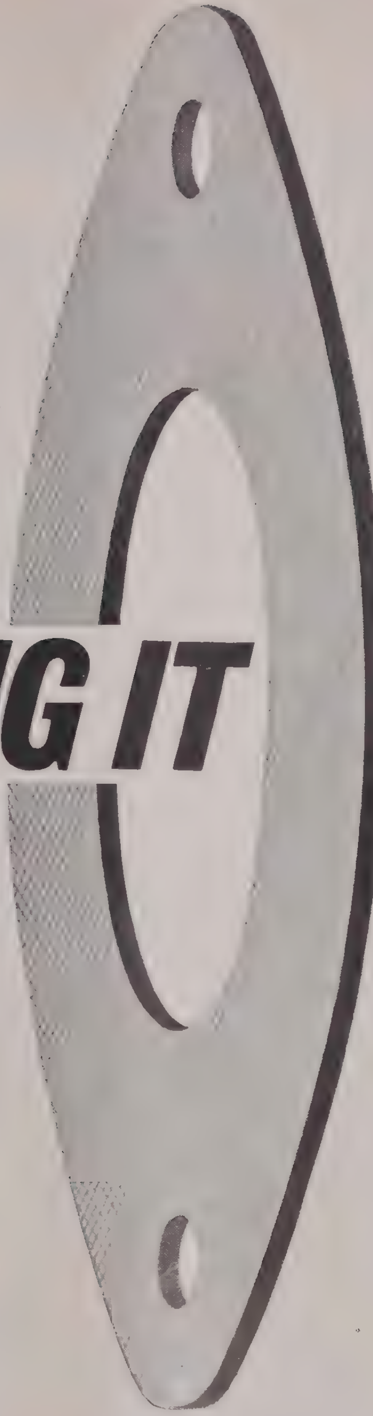

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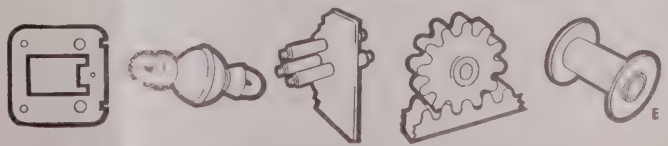

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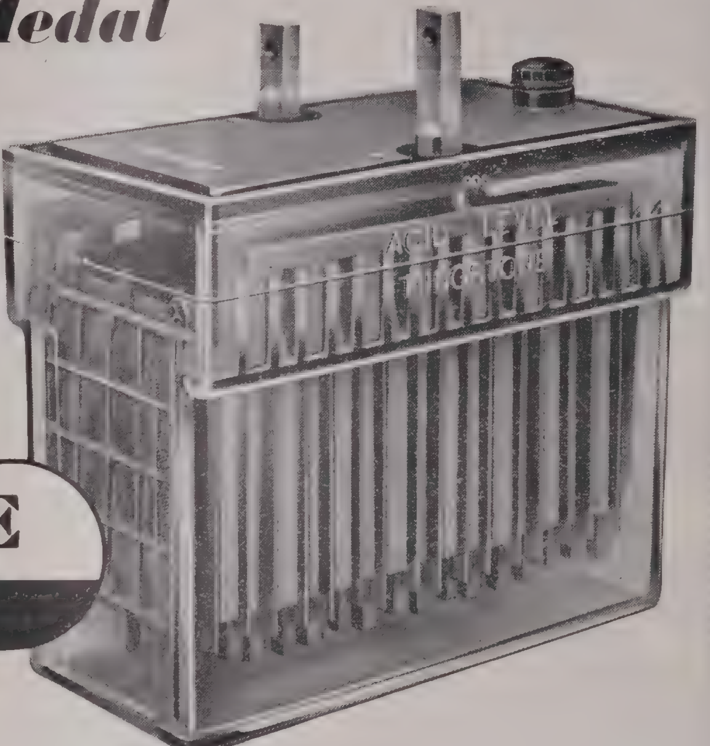

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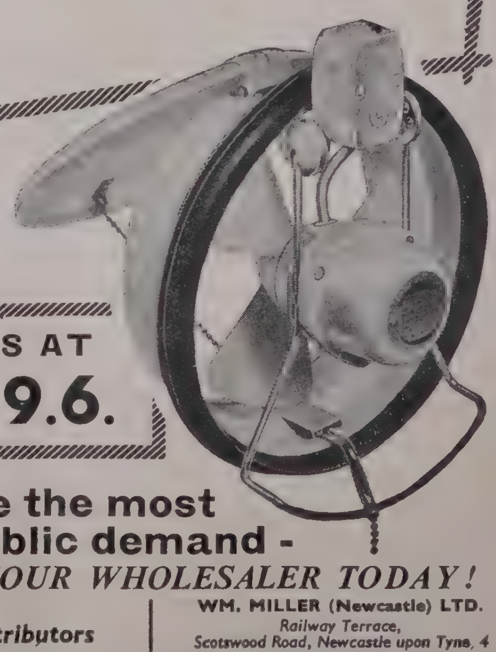

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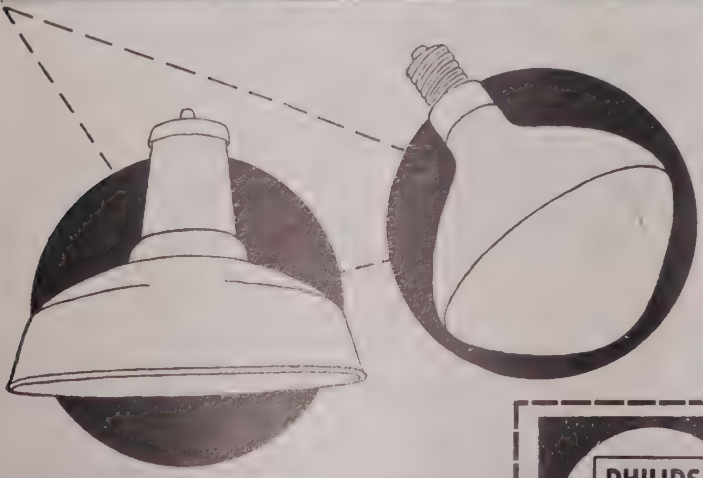

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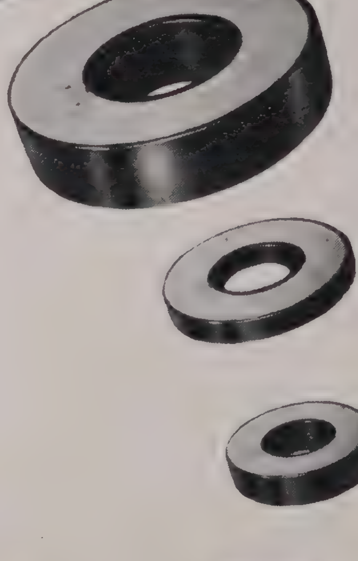

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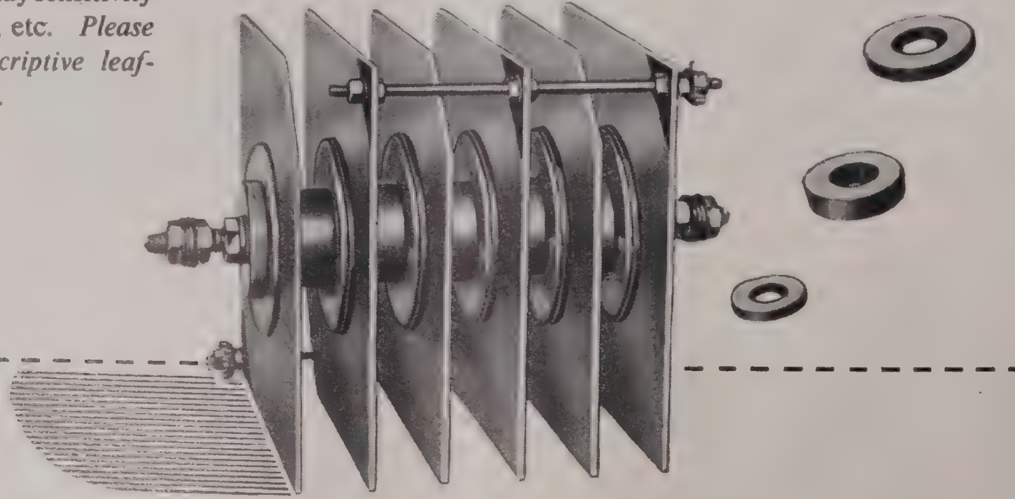

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Associated Electrical Industries Limited

INSTRUMENTATION DIVISION-Scientific Apparatus & X-Ray Department

Trafford Park, Manchester 17

N/M501

FRIDAY
24 JUNE
1960

ELECTRICAL REVIEW

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HUGH S. POCOCK, M.I.E.E.

General Editor:
J. H. COSENS

Technical Editor:
A. R. POLLARD, A.M.I.E.E.

IN THIS ISSUE

Very High Voltages	1193	Comment is made on developments in transmission techniques including auto-transformers to superimpose higher voltages on existing networks; h.v. cables to match the performance of overhead lines; and the operation of cables under forced cooling
Large Power Networks	1195	The biennial C.I.G.R.E. Convention began in Paris last week and closes tomorrow (Saturday). Altogether 132 papers have been presented. The subjects dealt with in this issue include insulator studies, radio interference, and system stability and planning
Electrical Contractors at Scarborough	1201	The annual conference of the Electrical Contractors' Association and its allied organisations has been held this week at Scarborough. Following the presidential address by Mr. V. J. Stock, papers were presented on electric floor warming and the future pattern of retailing
Planned Production with Electricity	1209	The author, who is agricultural engineer to the Eastern Electricity Board, deals with the application of light and warmth in horticulture
Diesel-Electric Pullman Trains	1211	On 4th July, new diesel-electric Pullman train services are to be introduced in the Western and London Midland Regions. The designed maximum service speed of the multiple-unit stock is 90 m.p.h.
Designed for Television	1218	The B.B.C.'s new Television Centre at White City, London, has been designed specifically for the requirements of television and will produce some 1,500 hours of electronic programme material a year

◇ ◇ ◇

Views on the News	1200	**Generation and Development**	1232
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VOLUME 166 NUMBER 26 ◇ *Eighty-Eighth Year of Publication* ◇ FRIDAY PRICE 1s 6d

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ELECTRICAL REVIEW

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Very High Voltages

EVERY two years the validity of the maxim " when in doubt choose the higher voltage " gains additional support from discussions at C.I.G.R.E. Only eight years have elapsed since the first 380 kV transmission system, in Sweden, was put into operation. With the continued rapid growth of demand for electrical energy in the meantime, commercial practice has almost everywhere followed hard on technological advance, as it should, and voltages more than half as high again are under consideration for the needs of the near future. Another sign of the times this year is the prominence given to large auto-transformers with a view to superimposing new systems at even higher voltages on older main transmission networks as exemplified in the 132/275 kV units embodied in the British grid, some sections of which have been designed for later conversion to 380 kV. (The first section uprated to this voltage is expected to be in experimental service two years hence, as reported in our last issue.) Still later, when justified by the economics of load growth, an increase to 500 or 560 kV is envisaged.

To the two especial functions of direct current transmission, the one to convey energy for long distances over land and the other for relatively short mileages by submarine cables, there has now been added a third. That is the ability it provides for the interconnection of two large a.c. power systems to obviate difficulties due to frequency differences or system irregularities on either side. Kelvin is reported to have added a further advantage of d.c. in avoiding much of the mathematics involved in calculations.

Knowledge of the physics of h.v. circuit-breaking seems to have reached a point at which the capability of switchgear can be assured to cope with future rupturing capacities. There is also encouraging evidence of the likelihood of h.v. cable sections matching the performance of overhead lines to which they may be joined. The operating of cables under forced cooling which, like the other advances mentioned above, seeks to exploit to the full the use of materials, is in line with the general engineering trend of providing more power from less weight in smaller space. To judge from operating experience up to now, prospects of future technical progress are bright, but it cannot be assumed that mere extrapolation from present knowledge will be enough. Many apparent paradoxes owing to as yet unpredictable factors in physics and other sciences will call for explanation. To the pooling of thought and experience by members of the C.I.G.R.E. International Study Committees in the periods between the Paris meetings much of the effectiveness of the discussions there will be due.

THE NUCLEAR FUTURE

The decision to make a substantial reduction in the size of the nuclear power programme is a further serious blow to the fortunes of the manufacturers who have invested heavily in this new industry. To have achieved the target previously set for 1966 would have meant a considerable acceleration in the past rate of ordering equipment during the next two years. In present circumstances such a policy was clearly impracticable.

The decision was not therefore unexpected. The nuclear power stations at present being built in this country have a two-fold purpose: to provide for an estimated gap in conventional fuel supplies and to give the manufacturers and supply industry experience in building and operating the new equipment. Changes in the world energy situation and unexpected improvements in the efficiency of conventional plant have removed the immediate need for nuclear power and put back the date when it will be commercially competitive. As a result, the market abroad for these stations has faded and most countries are now waiting for the results of expected developments in reactors that will bring down the price of nuclear power before committing themselves. In this country there have also been increasing doubts as to the wisdom of building so many large stations of a type that is already obsolescent. Within two years it should be already possible to start building stations using the advanced gas-cooled reactor.

CONTINUING DEVELOPMENT

The ultimate need for nuclear power is not however reduced, and if we are to maintain our pre-eminent position in the nuclear power field there must be continuing development and experience. A lowering of nuclear power costs depends on significant advances being made in reactor design and uranium fuel element performance. And this, Sir Christopher Hinton has pointed out, calls for the construction of at least one nuclear power station a year. This agrees with the rate of commissioning anticipated in the White Paper, and Sir Christopher has expressed the view that it is sufficient " to keep alive and healthy a nuclear power industry of a size needed in the long run." It seems doubtful, however, whether there will still be work for all the teams of engineers that have been built up by the manufacturers, and once these have been dispersed they will not be easily reassembled. It would help if manufacturers could be given the opportunity of doing more research and development work on the advanced reactor systems now being studied by the Atomic Energy Authority.

INTERNATIONAL ENERGY RESOURCES

Regret at the cessation, with the present edition (reviewed on a later page), of the Statistical Year Book of the World Power Conference will be tempered by the announcement by Sir Vincent de Ferranti (chairman of the International Council, W.P.C.) that it is to be replaced by a six-yearly Survey of Energy Resources with authoritative commentary. The Year Book, a pioneer enterprise of its kind, has given indispensable service since 1936, but with the development of the Statistical Office of the United Nations, to which responsibility for its chief functions is to be transferred, some overlapping was inevitable. It may be assumed that the original aim of presenting accurate information on a strictly comparable basis as early as possible after compilation will be maintained and that the obvious difficulties in doing so will be progressively surmounted.

THOUGHTS FROM SCARBOROUGH

Among the matters to which Mr. V. J. Stock referred in his presidential address at this week's annual conference at Scarborough of the Electrical Contractors' Association was the danger of price anarchy in the electrical industry. He did not hesitate to castigate those contractors who had aggravated the troubles of the cable industry by squeezing extra discounts out of manufacturers. Mr. Stock lamented the threatened liquidation of the Electrical Fair Trading Council, as we do, considering it to be a stabilising influence benefiting both the industry and its customers.

On labour matters the president was forthright in his views on the shorter working week and " productivity." He is unfortunately likely to be right in his contention that the shortening of the working week merely means a lengthening of overtime hours. But can the position with regard to timekeeping and " breaks " be so bad as to justify his assertion that proper observance of the rules would lead to a 12½ per cent increase in production?

TOO HASTY?

The Government has been justly criticised for the way in which it has manipulated the hire-purchase regulations—first creating a boom by sudden relaxation and then seeking to stem the tide by re-imposing restrictions. Manufacturers of domestic appliances were impelled to expand their productive resources and their labour force only to be faced two years later with the possibility of a severe shrinkage of business.

But because the Government has been precipitate, we do not think that manufacturers should emulate its example. In announcing their decision to reduce the number of employees by about ten per cent, Hoover, Ltd., appear to have acted rather hastily. Apart from the consequences to the people immediately affected, it seems to us that it may do further harm to the company's own sales. It is significant that some other companies equally concerned in this matter have announced that they are not yet experiencing " redundancy." In any event, if retrenchment becomes inevitable it is better that the process should be a gradual one.

LARGE POWER NETWORKS

DISCUSSIONS AT C.I.G.R.E. CONVENTION IN PARIS

The eighteenth International Conference on Large Electric Networks, which is more generally known as C.I.G.R.E., opened in the Fondation Berthelot in Paris on 15th June and concludes tomorrow (Saturday). A large number of delegates from all over the world have been attending, and during the technical sessions 132 papers have been presented and discussed. In this article we deal with the first half of the proceedings

Paris was hot and sultry when the eighteenth C.I.G.R.E. convention opened on 14th June. The opening ceremony was presided over by M. Jeanneney, the French Minister of Industry, who inaugurated the convention by stressing the importance of large power networks and the great value of the work of C.I.G.R.E. in this particular field of electrical engineering. After the Minister had expressed his interest in the convention Mr. G. Silva (president, C.I.G.R.E.) welcomed the delegates to this eighteenth function in the series and explained the significance and scope of the proceedings. Two short speeches were then delivered by Messrs. J. Mollerhoj (Denmark) and M. Vidmar (Yugoslavia) on behalf of the English- and French-speaking delegates respectively. The opening ceremony was rounded off by M. P. Ailleret, assistant general manager of Electricité de France, who delivered a short, but interesting, illustrated address on the French electric power system with particular reference to the 380 kV network and interconnections with other countries.

The technical sessions began on Thursday morning, 16th June, with discussions of papers sponsored by the Committee for Insulator Studies, which was presided over by G. H. Gillam (Taylor Tunnicliff). During this session L. Gion and H. Meier (France) described an insulator having helicoidal sheds which can be used as line insulators as well as in high-voltage apparatus. The authors said that in many cases the reduced dimensions of the helicoidal sheds provided characteristics which were better than those of classical insulators. The lengthening of the leakage line and the auto-cleaning properties of this form of shed offered the possibility of finding an effective solution to the pollution problem. The design under investigation for lines had the further advantage of being unpuncturable and anti-parasitic. Another advantage was that it withstood power arcs particularly well, and for high-voltage applications individual protection by horns ensured perfect safety.

The activities of the working group on the measurement of the performance of insulators in polluted atmospheres were reported by Dr. J. S. Forrest (Central Electricity Research Laboratories), who said that the mechanism of flashover was now well understood and it was possible to determine whether an artificial test was accurately reproducing the service conditions. It was clear that the more recently developed artificial pollution tests were realistic and gave promising results. For instance, artificial pollution tests could reproduce the very large reduction (about 80 per cent) in flashover voltage which had been experienced under actual operating conditions. In judging these results, however, it was necessary to use natural pollution tests, or service experience of an extensive overhead line system, as the final criterion of which form or forms of artificial pollution test reproduced actual service conditions best.

One of the best methods described was due to P. J. Lambeth and D. F. Oakeshott (C.E.G.B.). The insulator under investigation was energised at constant voltage and then subjected continuously to a fine wind-borne salt spray. The leakage current was recorded and the surges observed oscillographically. The time to flashover, which was normally between 15 min and a few hours, was taken as the criterion of performance, provided that the voltage applied was sufficiently close to the working voltage. To carry out the test, a wind tunnel was used with a 7·5 h.p. fan to produce the air flow. The tunnel cross-section was 5ft square at the back, opening up to 10ft square at the test end, where there was accommoda-

Sir Vincent de Ferranti

[illegible] lchon

Mr. G. H. Gillam

Dr. J. S. Forrest

Mr. P. J. Lambeth

Mr. D. F. Oakeshott

The French Minister of Industry, M. Jules Jeanneney, officially opening the convention

tion for insulators rated up to 132 kV. The total length was 25ft. The spray was produced by directing a constant pressure jet of 15 per cent salt solution on to the fan entry.

In a contribution dealing with radio interference from insulators, Dr. J. S. Forrest said that the intensity of the interference generated by insulators varied with the type of insulator. High-voltage suspension or tension insulators of the cap-and-pin or Langstab types gave rise to comparatively little interference in dry weather, although trouble had been experienced due to faulty contacts between links in an insulator chain. Interference from these types of insulator increased in wet or humid weather and might be particularly severe where atmospheric pollution accentuated the surface discharges on the insulators. Pin insulators on lower-voltage lines were a more serious source of interference due to discharges at the head of the insulator and, to a lesser extent, in the pinhole. This type of interference was often worse in dry weather and might be severe at television frequencies. A great improvement could be effected by using insulators with metal-capped heads or with conducting glaze on the head and at the pinhole. It was important that the metal cap should be in intimate contact with the insulator. The use of conducting grease to suppress discharges on the head of the pin-type insulators was not recommended. L. Gosland (E.R.A.) said that there was a need for the collection of a proper and uniform basis of statistical information on the magnitude of radio interference fields, with the ancillary information necessary to relate this, if required, to operating voltage, the main relevant features of line design and equipment, and weather conditions.

System Stability

The great importance which is attached to system stability all over the world was illustrated by the fact that no fewer than eighteen papers were presented at the technical sessions concerned with this subject. Among these was a study committee report giving an analysis of the different methods of load-frequency control. It had been prepared under the chairmanship of M. Renchon (Belgium) and among the authors was E. B. Powell (C.E.G.B.).

Most of the methods of power-frequency control, either in use or under consideration, were intended to maintain under normal operating conditions the mean frequency and power exchange at their specified values. To attain this condition an element causing the integration in respect to time of a linear combination of the deviations of frequency and interconnection power must be incorporated. When this equipment acted on a large number of machines on the network it could be used also to ensure an economic distribution of the load between sets. This latter function, which was being developed in certain networks, did not modify the principles of the system. In effect it was accomplished either by a filtering system which, at a given instant, selected the machines undergoing power-frequency control in order to attain an economic optimum, or by means of a special impulse train the action of which was much slower than that of the normal network regulator.

Mr. L. Gosland

Mr. E. B. Powell

There was also, besides the schemes including control by integration, a method which was solely a proportional control of power frequency, with the result that the mean frequency and power exchange did not remain constant at their specified values. The suppression of the integrating element slightly relieved the operating conditions of the regulator and the use of this method on certain networks was envisaged.

A working group under the presidency of A. R. Chorlton (C.E.G.B.) examined the under-excited operation of turbo-generators. Many tests had confirmed the possibility of operating at very high values of the generator internal angle. Angles higher than 130 electrical degrees had been obtained without loss of stability by the use of a rapid and continuous voltage regulator. These results encouraged operators to consider important alterations of the usual values of generator characteristic parameters especially the short-circuit ratio. A reduction of the cost of the machines should follow a reduction of this short-circuit ratio.

Investigations on the under-excited operation of generators had been carried out on several networks and had confirmed the importance of the turbo-generator asynchronous torque. Besides the purely constructive problems raised by such operating states, this particular aspect of generator behaviour should be noted because of the influence it could have on network dynamic stability. Very weak energisation operating called for operators with sufficient confidence to make a serious reduction of the generator's energisation voltage and many operators lacked this confidence. British representatives reported methods of overcoming hesitation on the part of operators; these methods consisted mainly in demonstrations showing the true possibilities of reactive power absorption without causing loss of synchronism.

The performance of continuously-acting voltage regulators with additional rotor angle control was discussed by V. Easton and J. A. Fitzpatrick (C.E.G.B.) and K. C. Parton (G.E.C.). They described a new regulator system for large generators which had been successfully put into service and a large number of site tests conducted. The important new feature was the use of rotor angle signals for control and stabilisation in order that the regulator system might achieve the most comprehensive overall control possible.

The rotor angle signal was taken from a small permanent magnet generator attached to the shaft; this gave an accurate signal in both steady state and transient conditions. The regulator itself was entirely static and the only rotating components were a homopolar generator to give a 400 c/s supply, and the main d.c. exciter.

J. K. Dillard and H. K. Sels (U.S.A.) described a new approach to system planning involving "operational gaming" and "Monte Carlo" methods. These methods were statistical approaches to the selection of likely combinations of random events. A mathematical model of the utility system was set up on the digital computer. When the random events were balanced against human competition through the use of gaming methods, the model operated just like the actual system. It ran the system hour by hour for a 20-year period or longer. It computed the risk of losing load. It permitted machines to be taken out for maintenance or forced outages. It built transmission facilities as required. After several 20-year games were played, a plan of expansion was evolved and evaluated. Then the computer printed out the whole expansion programme with dates of generation additions, capital requirements, and the present worth of all future revenue requirements.

The control of the interconnected power systems of Sweden and Finland was dealt with by A. Wedeen and K. E. Johansson (Sweden) and E. Voipio (Finland). When the Swedish and Finnish power systems were interconnected during the spring of 1959 the regulation of the tie-line power was added to the control programme. The Finnish network, being the smaller partner, was provided with an automatic tie-line power regulation system, the design of which was expected to constitute a progressive step in the development. The frequency regulating method employed in Sweden and Finland was characterised by a large number of power stations participating in the regulation, most of which were controlled by electro-hydraulic governors. By introducing a supplementary signal to the governors a simple tie-line power regulating system was established which, in addition to fulfilling conventional requirements, was distinguished by quick action.

Mr. A. R. Chorlton

Mr. K. C. Parton

Dr. R. H. Golde

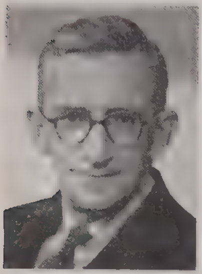
Lightning and Surges

The report of the study committee on lightning and surges (H. Baatz) discussed the two basic parameters on which present predictions of the lightning protection of overhead lines depended. These were the measurements of lightning current amplitudes and the shielding effect of overhead earth wires. The protection of substations connected to overhead lines through comparatively short lengths of cable was also considered. As a result of many measurements of the amplitudes of lightning currents on overhead lines, Dr. R. H. Golde

Left to right: Messrs. F. J. Lane (Preece, Cardew & Rider), R. W. Mountain (Kennedy & Donkin), M. D. Stonehouse (Electricity Council); T. R. F. Harrison, W. G. Hawley, Mrs. Goodall and Mr. S. E. Goodall (A.E.I.)

(E.R.A.) showed that correct results could be obtained from oscillographic records and from magnetic links on lightning conductors, extension rods of towers and overhead earth wires when lightning struck the earth wire in the plant. Magnetic link measurements in tower legs and other evaluations were liable to serious error.

In another contribution D. Müller-Hillebrand (Sweden), O. Johansen (Norway) and E. Saraoja (Finland) described experience gained in Scandinavia with 167 Pierce-Golde type lightning counters. The sensitivity of this lightning counter had been altered to provide a range of about 15-21 km which reduced the number of discharges between clouds affecting the counter. The number of flashes to earth was determined at 65 ±15 per cent of the discharges recorded and the observations with lightning counters proved to be more reliable than acoustic observations. In South Sweden the number of lightning strokes to earth was determined at 50-60 per 100 km^2 and at 10-16 per 100 km^2 for two islands in the Baltic; this was a year relatively poor in thunderstorms. Experience with the counter showed that its operational dependability needed improving.



Mr. F. J. Lane

Mr. D. H. Tompsett

Mr. A. Stalewski

D.C. Transmission

Reporting on the work of the study committee dealing with high-voltage direct current transmission, the chairman, F. J. Lane (Preece, Cardew & Rider) referred to the two projects now in hand, namely, the Anglo-French link of 100 MW at ±100 kV and the Stalingrad-Donbas scheme of 750 MW at ±400 kV. In addition, a d.c. connection between the South and North Islands of New Zealand was under consideration. Interest in the subject had also been shown in Canada, Italy and Venezuela. No official information had been received on operating experience for the two schemes already in commercial operation, viz. the Kashira-Moscow and the Sweden-Gotland connections. The discussion followed the lines recommended by D. H. Tompsett who had suggested that speakers should concentrate on the English Channel crossing and the U.S.S.R. project.

This report had five appendices. Two by V. Lamm (Sweden) concerned rectifying equipment and control. In Russia anodes of high current rating within 100 kV had been employed whereas in Sweden and for the Channel link the valves could be developed for higher voltages but with lower anode currents. No more than two valves in series in each bridge arm seemed necessary, but one would be preferred when design progress permitted. By the method of control adopted in Sweden constant frequency was maintained at the receiving end. A d.c. link could be a stabilising unit in an extensive a.c. system, counteracting any tendency towards oscillation during system disturbances. To eliminate harmonic disturbances, E. Schulze (Germany) held that the pulse number should be fixed at twelve and filters should be damped capacitor banks. A generator used solely for feeding d.c. transmissions must have a damper winding rated at a certain percentage of its output which might introduce design difficulties with high-speed generators though not with low-speed hydro units. A. Stalewski (Great Britain) submitted that shunt capacitors offered at present the most economical and the simplest method of providing the reactive power requisite for a.c./d.c. conversion, particularly when operated with harmonic filters.

Corrosion problems arising out of the use of an earthed return were discussed by J. H. Gosden (Great Britain) who pointed out that while cathode electrodes presented no problems, metallic anodes directly buried in soil or immersed in the sea suffered severely, although iron was satisfactory if surrounded by magnetite. Experience with graphite had been disappointing owing to gas formations in its porous construction, but wax impregnation could result in low rates of deterioration of the same order as for high-silicon cast iron and for metallic anodes surrounded by a back-fill of coke breeze. Titanium coated with a thin layer of platinum, though expensive, had a long life in sea water. Unless spacings between electrodes and neighbouring structures were very large, d.c. flowing in the latter might necessitate cathodic protection.

In a comprehensive paper J. Sallard and R. Tellier (Electricité de France) and D. M. Cherry and C. C. Barnes (C.E.G.B.) reviewed the engineering problems associated with the Channel link with special reference to the terminal stations and to the submarine d.c. cables and the methods to be adopted for their handling, laying

Left to right: Dr. J. S. Forrest (Central Electricity Research Laboratories), Mr. D. F. Amer (A. Reyrolle & Co.) and Mr. G. H. Gillam (Taylor Tunnicliff); Messrs. J. G. Corbett, M. A. Bechtler and A. N. Vassilissin (English Electric Co.); Messrs. R. A. McMahon (vice-president, C.I.G.R.E.) and H. W. Grimmitt (Ministry of Power)

Messrs. A. R. Cooper (C.E.G.B.), C. R. King (Electricity Council) and Sir Vincent de Ferranti (chairman, British National Committee, C.I.G.R.E.)

and repairs. Although for overhead lines d.c. was found attractive economically only for large powers and distances, for submarine installations a.c. became impracticable at comparatively short distances without means of intermediate compensation for charging current. In the Channel scheme d.c. presented the further advantages of requiring fewer cables with consequently reduced fault hazard and reduced encroachment on telegraph cable routes, and of being controllable independently of normal frequency and voltage variations. Choice of d.c. transmission voltage was limited by cable insulation and conversion plant. Allowing for the severe mechanical stresses occurring in submarine work the present limit for single-core cables appeared to be about 300 kV at which a 1 sq in conductor (giving a cable of 4·62in in diameter) and a current rating of 1,360 A could be readily handled at sea. For conversion plant present experience suggested a maximum of two valves in series and an inverse voltage of 150 kV per valve as a practical limit, corresponding to the ±300 kV limit of submarine cables. Mid-point earthing of the Channel d.c. system would be adopted, a sea return not being feasible in the circumstances. Routes were restricted to depths of less than 300 to 400 metres in view of the weight of power cables, and the need to avoid making joints at sea. The conductor working temperature with d.c. might have to be limited to less than the normal maximum to avoid excessive dielectric stress in the outer layers of the insulation, depending on the temperature gradient. Plastic insulation was light, required no metal sheath and should be easier to repair. It offered attractions especially for d.c. in which discharges were very few, but the use of polythene appeared to be limited at present to voltages not exceeding 100 kV to earth. Impregnated paper seemed the only insulant sufficiently reliable above that voltage and capable of withstanding electric stresses of 300 to 400 kV/cm with d.c. compared with 40 to 50 kV/cm with solid type a.c. cables, but the application of pressure did not permit of the use of appreciably higher working stresses as it did with a.c.

A paper dealing with the other aspect of d.c. transmission—a long-distance overland route—was presented by E. S. Groiss and others (U.S.S.R.). This related to the 800 kV (±400 kV) overhead line which was designed to link the Stalingrad hydro-electric plant with the Donbas grid, the largest system in European Russia, 475 km away. Capital expenditure for conveying 750 MW would be about the same as for an a.c. line but considerable economic advantage was expected later with extensions to the system. Moreover, d.c. would permit, as between different electrical systems, independent frequency regulation, and automatic and preset control of power and would limit effects of faults. The possible use of earth return and improved protection and automation were other favourable factors. Each convertor station would contain eight series-connected 100 kV valve bridge circuits. Reactive requirements were met at Stalingrad by the generators and at Donbas by a battery of capacitors. For each pole of the line two a.c.s.r. 712 mm^2 conductors horizontally spaced 400 mm apart were provided. Average annual corona losses were expected to be 4 kW/km. Average span lengths were 370 m.

Measurements carried out in Sweden for determining precautions against undue radio interference from the convertors at Lydd included in the link with France were described by R. E. Martin and J. N. Prewett (Central Electricity Research Laboratories). It was assumed that the interference resulting from the generation of high-frequency currents which circulated in the plant, the associated network and the 150 MW plant, would be proportional to the power rating of the convertor station, so 9 dB was added to the levels obtained at the 10 MW Swedish station at the reference points 100 m and 1 km distant. From the known broadcast programme levels in the Dungeness area, the distances from the station and associated lines at which the signal-to-noise ratios exceeded the normally accepted minimum of 40 dB could be calculated. The station structure was to be a sheet metal clad steel frame building of 338,000 cu ft (20 per cent more than a normal building) with a metal mesh laid in the concrete floor and bonded to the walls and would cost about £90,000 or 40 per cent more than an unscreened conventional brick or concrete building compared with a 50 per cent increase incurred through incorporating mesh screening.

Mr. D. M. Cherry

Mr. C. C. Barnes

Mr. R. E. Martin

In a comparison between d.c. and a.c. insulators, H. Witt (Sweden) pointed out that on grid-controlled d.c. systems switching surges and other internal overvoltages were negligible. Ability of the insulators to withstand normal service voltage would, therefore, be the determining factor. In polluted atmospheres the leakage distance should be the same as for a.c. (5 to 7 cm/kV to earth), giving also ample protection from lightning. In clean areas, through which most long-distance transmission lines would pass, the requisite leakage distance might be only [illegible]/kV to earth.

(To be concluded in next week's issue)

VIEWS on the NEWS

By "REFLECTOR"

LIGHTING was once the principal means by which electricity secured the entrée to people's homes; today people want electricity primarily for television, it seems. Accordingly this is the way in which *The Star* reports the imminence of a supply to a Kentish village :—

> "Television is coming nearer for the villagers of Barfreston, Kent. A scheme to take power to the village has been approved."

The importance of television is recognised by the Electricity Boards. Recently the supply to Wold Newton, near Bridlington, Yorkshire, was to have been interrupted one afternoon for maintenance work. The consumers there pointed out that this would prevent them from seeing the Derby on television and so the Yorkshire Board rearranged its work to avoid a cut during the race.

* * *

British Railways are gradually dispensing with their steam locomotives but it will be some time before there is complete "dieselisation" and electrification. In the meantime the Swiss railways have just become totally electric with the opening of the service between Cadenazzo and Luino (Ticino). Holland has already abandoned steam traction, and a *Guardian* reporter, who has been studying the Russian railways, says that no steam locomotives have been built in the Soviet Union for the past three years and by the end of next year the last steam locomotive in the Moscow area will have disappeared.

* * *

Overhead lines, so necessary if electricity is to be provided at a reasonable price, are constantly in somebody's way. It is their appearance which is the usual cause of complaint, but often farmers object to them because they interfere with their agricultural processes. What is to me a new grievance is reported from Hertfordshire. It comes from aviators employed on the job of spraying crops with insecticides or fertilisers. Naturally they have to operate as close to the ground as possible and it is complained that the presence of overhead lines in fields makes the work rather hazardous. I do not imagine that this trouble is widespread, however, and so it cannot be pleaded as a substantial argument against overhead transmission.

* * *

Persian children, like British and I suppose children in other parts of the world, are fascinated by overhead lines and cause a great deal of trouble either by smashing insulators or by bridging the lines. Mr. F. E. M. Hardy (Iran) has sent a cutting from the *Tehran Journal* dealing with the "shorting" of a 20 kV line by an iron hoop, thrown by a child, which put a portion of Tehran into darkness recently. Exhorting parents to exercise better control of their children, the managing director of the Tehran Electric Company is reported to have said:—

> "Irrepairable harm and damage both to the children who play such pranks as also to the electric company may be caused if sufficient care and precaution is not taken by their parents in acquainting their offsprings of the dangers involved in meddling with overhead wirings."

* * *

"The Case for Coal" puzzles me. This illustrated booklet published by the National Coal Board shows that 86 per cent of the electricity and 94 per cent of the gas in this country is produced from coal, yet its apparent purpose is to persuade the public to burn solid fuel instead. To the architect and consulting engineer it says "Your clients may want open fires or part or full central heating: they will certainly want a hot water supply. Well, for all three there is nothing so economical as solid fuel—coal, coke, anthracite and manufactured smokeless fuels. . . ." Unlike the type of low-grade coal consumed in generating stations not all these fuels are overabundant. In any case, surely the burning of coal in a comparatively few large power stations is to be preferred to its distribution in the raw state to many thousands of factories, public buildings and homes up and down the country ?

* * *

Half a century ago the *Electrical Review* (24th June, 1910) reported an action in which the Attorney-General was successful in restraining Leicester Corporation from carrying out installation work. The Attorney-General contended that the Electric Lighting Acts confined the Corporation to the supply of electricity; the installation and sale of wiring and equipment was *ultra vires*. For the Corporation it was claimed that a clause in the 1882 Act gave electricity undertakings powers to "do all such acts and things as may be necessary and incidental to such supply." This was interpreted to mean that they could provide the means of using the supply up to the actual point of consumption. In his judgment the judge pointed out that if that had been so the Corporation would have had to supply the installation and maintain it in good condition free of cost. In later years some municipalities obtained powers by Private Acts to install wiring and provide appliances (for payment) and such powers were conferred upon all authorised undertakers by the 1919 Act.

E.C.A. Annual Conference

PAPERS AND DISCUSSIONS AT SCARBOROUGH

After an interval of thirty-three years the Electrical Contractors' Association and its allied organisations again chose Scarborough for their annual conference this year. Following the now accepted form, the proceedings opened last Sunday evening with a " Get Together " at the Grand Hotel at which we met many friends of past conferences as well as newcomers.

The first business session opened on Monday morning at the Spa Ballroom, an admirable setting, with the president, Mr. V. J. Stock, in the chair. An official welcome to the town was extended by the Mayor of Scarborough (Councillor J. Kennedy) who spoke of electricity's contribution to modern life. He mentioned the great Kariba hydro-electric scheme, saying that the first need of the under-developed countries was a supply of electricity. He wished that as much thought and money were being applied to the provision of nuclear power as to nuclear weapons.

In thanking the Mayor, Mr. Stock said that one of the Association's members was participating in the Kariba scheme. He then read his presidential address, an abstract of which follows.

Presidential Address

Mr. V. J. Stock, in the course of his address, said that although his main object was to give members an up-to-date review of the contracting and retailing industry he proposed to introduce matters pertaining to other sections of the electrical industry whose fortunes were inextricably bound together.

He believed that the past year marked a turning point in the tide of affairs in the entire electrical industry. It behoved everybody in it to ensure that the turn was towards increased prosperity and not towards disorganisation and chaos. With ever-increasing competition in overseas markets it was essential that individual concerns should build up financial reserves to support their overseas trade whenever foreign competition depressed the market, to ensure the retention of customers. Export trade could be maintained and expanded only if there were a healthy and profitable home trade based on economic prices giving a fair return to the distributors and a margin to the manufacturers sufficient to provide the necessary reserves.

Prosperity had been achieved by the electrical industry by a system of agreed trade discounts and list prices but during the past two years the industry's trade organisations had lost most of their power through their inability to control prices and discounts. Unless individual manufacturers were prepared to accept some measure of self-discipline the improvement and development of our products and the creation of new equipment would be so restricted as to jeopardise our standing in world markets. That self-discipline must also be accepted by distributors and contractors. The situation in the cable industry was unquestionably aggravated by contractors endeavouring to score over their competitors by demanding greater and greater discounts. As these were passed on to the customer the industry did not benefit; indeed the " plus " was applied to a smaller figure, resulting in an actual loss of profit. The loss was probably over £300,000 in nine months.

The Fair Trading Council, which for thirty years had provided the code of trading practice for the industry, was on the verge of liquidation. Its disappearance would be a tremendous loss to the industry and he besought manufacturers, wholesalers and retailers alike to keep alive the principles laid down by the Council.

Turning to matters of more direct concern to members, the President said that there had been solid progress in all fields of the Association's activities. The Electrical Retailers National Council's Retail Brochure had been in great demand and preparations were in hand for a more ambitious publication. The Council had also issued a price list of major domestic appliances and it was engaged in the production of various sales aids. Consideration was being given to a service for members designed to give sales training and showroom organisation instruction. In the past few days arrangements had been completed with a banking house which would enable retailing members to compete satisfactorily with the hire-purchase terms offered by departmental and chain stores.

The Association had become an active member of the British Lighting Council and it was also participating in the work of the British Electrical Approvals Board for Domestic Appliances. The Technical Committee kept in constant touch with developments in technique and co-ordinated the experiences of members throughout the country. Through this Committee the Association was in frequent consultation with the I.E.E. Wiring Regulations Committee and the British Standards Institution.

They had been active in contract matters and had been particularly concerned with the growth of the practice of placing of contracts at fixed prices, which had been extended far beyond the principles laid down by the Government three years ago. Manufacturers were not prepared to give firm prices for an indefinite period and the trade unions continued to press for improved wages and conditions. Mr. Stock urged members either to refuse to accept fixed-price contracts or to add a sufficient percentage to cover all possible contingencies.

"Committee X" had given consideration to many matters of vital importance to the whole membership; there was no intention that it should work exclusively for any one section. He was sure that the findings of the Committee, if accepted and adopted by the membership, would be of great benefit to the Association.

It was the Association's desire that the employers should share in the industry's prosperity. But contracting was not so profitable as it should be and that was due in no small measure to the fall in production evident since the war. Incentives, such as the reduction of the working week to 44 hours, had not improved production. Now they were asked to consider a further reduction and they had to accept the fact that this would only mean that overtime payments would commence earlier. If, however, operatives would honestly observe the rules for starting and finishing, and limit breaks to the agreed periods, there could be an increase in production of about 12½ per cent.

Mr. and Mrs. S. W. Podd and Mr. and Mrs. A. J. Whetton

It had not been possible to conclude the revised apprenticeship agreement because of certain fundamental differences between the Electrical Trades Union and the Association.

As contractors and retailers the members were essentially comparatively small concerns and in this age of amalgamation and "take-overs" were in a vulnerable position in maintaining their independence of thought and action. It behoved them all to support the Association, loyally accepting the Council's decisions and giving of their own time and effort to ensure the prosperity of all.

After the address and a brief interval the annual general meeting took place.

The only "business" in the afternoon was a fashion parade and tea party at the Spa Colonnade.

At the Spa Ballroom on Monday evening the Mayor and Mayoress of Scarborough held a reception, after which there was dancing.

Tuesday morning's proceedings began with the presentation and discussion of Mr. N. A. H. Stacey's paper on "Retailing—the Future Pattern" which is reviewed below.

Retailing—The Future Pattern

By NICHOLAS A. H. STACEY

In retailing, as in all other economic activities, new forces are impinging upon existing methods of business. Not much progress in retailing was achieved in Britain in the first fifty years of this century. In Britain and Europe most of the American developments were introduced in the years after the second world war. What we must examine is which new forms of retailing suit us best as a nation and how they can be adapted or improved to serve our best interests. But the most vital question before us is why should we innovate? Are traders not discharging adequately the retail function? And then we must go a stage further and ask—can we as a nation afford the rapid changes currently taking place in retailing and, having reshaped the pattern of retail distribution, what are the manifest benefits to the manufacturer, the trader and the consumer?

Rising Consumer Demand

It must be understood that we are not changing retailing methods just to satisfy our zest for progress; the need for change is imposed from the consumer end. High and constantly mounting consumer demand is here to stay. In every progressive economic society, the trend of development is towards sharply rising emphasis on "distributive" and "service" facilities. In an age of

1. Mr. C. R. Waterhouse (the new President) and Mrs. Waterhouse at the registration office. 2. Mr. and Mrs. A. J. K. Parker receive their "papers." 3. Mr. and Mrs. R. H. M. Drake. 4. Mr. and Mrs. G. T. S. Dickson. 5. Mrs. A. V. Milton, Mr. W. A. Speed, Mr. E. Simpson, Mr. and Mrs. W. T. Trace and Mr. A. V. Milton. 6. Mr. and Mrs. B. G. Wright. 7. Messrs. J. G. Briggs and L. C. Penwill (director and secretary). 8. Mr. H. F. Truman, Mr. and Mrs. G. N. Walker, Mrs. Truman and Mr. and Mrs. J. F. C. Prosser

Fashion parade at the Spa Colonnade

mass production where automation reduces the labour content, the number of workers in the manufacturing industries slowly declines and the number of people employed in trade and in the service industries continuously grows, relative to total employment. In America only one one-fifth and in Britain only two-fifths of the working population are engaged in manufacturing.

As a nation we must continue to " streamline " our retail trading organisation and strive for added efficiency. Productivity in the retail trades is not spectacular. Between 1948 and 1958 manufacturing productivity rose by 75·6 per cent and distributive productivity by 43·9 per cent. The contribution of the distributive trades to the gross national product rose by only 70·3 per cent between 1948 and 1958, while the contribution of manufacturing rose by 97·6 per cent. Since the adoption of labour-saving devices in retailing is costly, the demand for additional distributive facilities has been met by the recruitment of additional labour. Between 1948 and 1958 manufacturing employment rose by 12 per cent and the labour force in distributive trades by 19 per cent.

Fortune today is on the side of the big battalions. But since the demand for electrical goods is considerable and shows prospects of growing, the author is inclined to believe that the small man in the electrical and radio retail trade is better able than his fellow trader in many other branches to review his position and make the changes in his organisation which will keep him prosperous. Good times are more propitious for innovation than bad times—though the latter periods are more compulsive. Unfortunately, there is no straightforward textbook which conveys to traders how to be more efficient, but Mr. Stacey urged them to study the new literature about retailing and wholesaling and ask themselves what methods should they introduce to leap ahead ?

Among radio and electrical goods shops, the independents accounted in 1957 (and 1950) for 70 (72·3) per cent of turnover, 71·3 (82) per cent of employment and for 80 (84·4) per cent of all retail establishments as against 28·1 (26·7) per cent, 27·7 (17·5) per cent and 18·9 (15) per cent respectively for multiples and 1·9 (1) per cent, 1 (0·5) and 1·1 (0·6) per cent for co-operatives in this trade.

Self-Service for Electrical Goods

Good organisation and extensive standardisation are an integral part of a multiple shop's success; but their real strength lies in bulk buying capacity and in specialisation of merchandise. Their aim is to woo new customers. Mr. Stacey thinks that the most meaningful portent in British retailing in the 1950's has been the appearance of the self-service store and the supermarket. The belief still lingers that the supermarket and the self-service store are largely for the grocery and greengrocery trades. But one of the largest supermarket chains in Britain claims 12 per cent of its turnover in non-food lines. Electric lamps are said to be successful items and there is little doubt that certain kinds of electrical goods will be increasingly sold in self-service stores and supermarkets in the 1960's. There is a potent threat that unless the small retailer rationalises and ceases to be a high cost distributor he cannot continue, in the highly competitive world of today, as a profitable business. Thus for him, and in whatever trade, it is either innovate or perish.

The perennial cry of the small retailer that he is ground between the millstones of rising costs and inflexible manufacturers' margins is a subjective assertion and cuts little ice. Many manufacturers would be glad if their margins were as generous as those of many retailers. The retailer should want to ensure a rise in his trading productivity and not in his margins to ensure for himself a more profitable future.

The wholesaler should not only help the existing shop to make a better profit, but also help the retailer to expand and open additional retail outlets. Voluntary purchasing groups also enable retailers to take advantage of better terms, superior supplies and reduced cost, by improved wholesale organisation. The manufacturer is significantly helping the retailer by being responsible, almost *in toto*, for the promotion of his merchandise, and for creating public demand for it. The maker can further help the retailer by advising him on the results of his market research—who are the buyers to aim for, what are the features of the product which can be " sold " to the consumer, and how to link up the manufacturers' effort at demand creation—in terms of publicity and advertising —with the retailer's opportunity to sell the product. Furthermore, the smaller the retailer and the better he is doing, the more he needs in the way of credit. This should be made available by the manufacturer both for stockholding and for extension to the consumer in the form of hire-purchase.

Small Retailers' Future

The novelty about the small retailer is that providing he conforms to modern methods of selling, buying and office organisation, coupled with his convenience value as the local shop around the corner, he has no need to consider his business a wasting asset. But he must realise that modernisation of premises, up-to-date methods of display and skilled salesmanship are just as much needed by him as by the multiples which have long adopted these techniques. The small retailer has not been supplanted, not even in the United States, where

1. Mr. and Mrs. E. J. Davies with Mr. and Mrs. W. E. Babb.
2. Mr. and Mrs. S. V. Wise and Mr. C. J. Veness (vice-president)

1. Mr. J. R. Soans, Mrs. Wathes, Mrs. Soans and Mr. H. S. Wathes. 2. Mr. and Mrs. S. L. M. Barlow and Mr. and Mrs. R. A. Marryat. 3. The Hon. Mrs. A. F. Plummer, Mr. W. G. Barnett, Mr. A. F. Plummer, Mrs. Barnett and Mr. and Mrs. A. S. Redvers Pratt. 4. Mr. and Mrs. A. Ford

the number of retail outlets, on a population basis, is similar to that in Britain. Furthermore, the American scene is even more dominated by the chain store than is the British. Consumer demand is on the upgrade in this country and there are real opportunities for the small retailer if he adapts himself. Retailing is a skilled occupation which is constantly undergoing subtle changes.

Before the paper was discussed the president presented a gold medal and certificate to the outstanding apprentice of the year, Mr. R. L. Moody, who is with Dale Electric (Yorkshire), Ltd.

Mr. H. S. Wathes opened the discussion, saying that it was realised that changes were inevitable but it was difficult to time the rate at which they would take place. He also said that contractors had no prescriptive rights to a share of the business; it depended entirely on what they were prepared to do for themselves. Subsequent speakers (Messrs. H. F. Truman, D. Johnson, A. Apps, G. N. Walker and P. B. Etheridge) put a number of questions to which Mr. Stacey replied *seriatim*.

A further report will appear in next week's issue. Now we will content ourselves with a brief mention of some of the points raised. In the face of expressions of doubt, Mr. Stacey insisted that retailers' gross margins were much greater here than in the United States or Continental countries. He also pointed out that these margins were governed by efficiency and not merely by manufacturers' discounts. He did not think that the intrusion of "compound" trading groups into electrical trades would have a serious effect. Neither they nor multiple stores could give the service which the contractor-retailer could afford.

Tackled on the subject of retail price maintenance, he again thought that the abolition of the system would not have very serious effects. On the subject of advertising, he thought that this involved market research and a study of the retailer's particular area.

Mr. Johnson said that the manufacturers valued the independent trader; they would not like to be in the hands of large groups for the distribution of their products. But he also said that manufacturers could not protect the "independents" from competition. Mr. Stacey maintained that large orders merited extra consideration from manufacturers.

At the conclusion of the session Mr. Stock expressed the members' appreciation to Mr. Stacey.

On Tuesday afternoon a paper on electric floor warming was presented by Mr. R. D. Jackson: a synopsis follows.

Electrical Floor Warming

By R. D. JACKSON

FLOOR warming presents the electrical contractor with an opportunity of increased business in a field normally covered by the heating engineer. There are, however, many difficulties to face in this complex field and to be successful the contractor must equip himself thoroughly or take advantage of the services offered by manufacturers. This applies to the actual heating of the building; the electrical side conforms to ordinary practice.

The manufacturer's service extends only to the proper use of his equipment and it is the heating engineer who carries out the design and submits tenders. The author points out that in the absence of a code of practice manufacturers put forward schemes which may differ greatly in price and efficiency claims.

The suitability of a particular building for floor warming must first be determined. Generally, those used intermittently are unsuitable on economic grounds whereas continuously occupied establishments, as hospitals, fire stations, etc., offer the possibility of the keenest competition with conventional heating methods.

A properly designed system should be based on the architect's drawings and detailed information of wall and roof construction. If possible, overall " U " values should be agreed before calculations are commenced. (" U " values express the heat losses of the building taking into account all the relevant factors.) A handbook published by the Institution of Heating and Ventilating Engineers, " The Computation of Heat Requirements for Buildings," gives " U " values for common forms of construction; for general purposes the value of outer walls should not exceed 0·3 and that of roofs 0·2. This handbook also gives recommendations on comfort levels for various rooms and maximum permissible floor surface temperatures. The paper outlines the points to be included in a specification when a manufacturer's assistance is being sought, attention being paid to comfort effect, " U " values, scope, downward losses, local off-peak periods, floor surface limits, loading and electricity consumption. The author briefly indicates the way in which the electricity supply is used and says that, according to the design, the consumption per kW installed will range from 1,200 to 1,600 kWh per annum.

In the next section of the paper the author deals with loadings and applications, mentioning that too high a loading is not disadvantageous if the system is properly controlled. He also points out that the cheapest heating layout is not necessarily the cheapest overall when wiring and distribution costs have been added.

Some details are then given of the alternative rewirable and directly embedded systems of floor heating. He says that the latter are generally cheaper and that there is no difference in operation between the two methods under the same conditions, nor does a so-called heat diffuser laid over the elements or tubes have any material effect.

Thermostatic controls are next dealt with. The importance of correct placing of thermostats is stressed and it is said that air thermostats offer the best means of control; floor thermostats should be used only as floor-temperature limiting devices. External controllers should be applied only to buildings which are occupied solely during normal daytime hours.

In dealing with electrical distribution arrangements, the author says that floor warming sometimes affects the system supplying other electrical services and he advises methods of co-ordinating them. Site supervision is of the greatest importance and this is the responsibility of the contractor, who should be sure to obtain installation instructions from the manufacturer, wholesaler or other agent.

Mention is made of the lack of efficient fault-finding equipment. The one really reliable set of equipment, developed by Mr. Arkinstall of the Midlands Electricity Board, has proved that, to date, there have been no faults due to bad manufacture of elements, while other trades share the blame for faults as much as electricians. There should be close co-operation with the builder and during [illegible] the elements should be monitored until screeding is completed.

Domestic premises are specially mentioned because of their different operating conditions. After showing the [illegible] for keeping the heating elements clear of sound

1. Mr. and Mrs. A. C. Gale. 2. Sir Edward and Lady Anderson. 3. Mr. F. Conisbee, Mr. J. H. Butterworth, Mrs. Butterworth and Mrs. Conisbee. 4. Messrs. A. H. Young and F. H. Farthing. 5. Mr. and Mrs. E. Maw. 6. Mr. B. E. Gray and Mr. J. W. Chadwick. 7. Messrs. J. D. Johnson, E. G. Plucknett, F. W. L. Tincknell and H. S. Wathes. 8. Messrs. C. E. Barnes, K. W. Tarran, I. L. Harvey and A. J. Johnson with Mrs. Barnes, Mrs. Harvey and Mrs. Tarran insulation in multi-storey buildings, the author mentions the effect of floor coverings upon heat output. It is recommended that living rooms in multi-storey blocks should be provided with a background temperature of 55-60°F, that thermostats should be omitted and the installation controlled only by time switch and external controller, leaving the tenants to boost the temperature to their requirements. For domestic premises an intake modified from that applicable to industrial and commercial premises is recommended, with a higher installed loading than is usual at present to give a quick heat-up. A simple form of graduated controller could be devised for single domestic premises in lieu of an external controller.

The last section of the paper deals with the nature and application of floor screeds, damp-proof membranes and perimeter insulation. There is a warning against the use of lightweight screed, which has an insulating effect, and it is said that the floor-warming system must not be used for drying out the screed. Perimeter insulation applied to small rooms will reduce the annual electricity consumption by about 10 per cent. The author concludes by saying that the important thing to the client is annual outlay, not electricity consumption as such. The position will be most critical in low off-peak tariff areas.

The paper is illustrated by a number of drawings and there are twelve tables containing a good deal of useful data.

Mr. F. W. Blanshard opened the discussion by mentioning one or two points on the thickness and uniformity

1. Mrs. H. D. Parsons, Mr. and Mrs. L. C. Penwill, Mr. and Mrs. V. J. Stock and Mr. H. D. Parsons. 2. Mr. A. O. Bruty and Mr. J. R. Soans. 3. Mr. and Mrs. L. G. Franklin. 4. Mr. C. J. W. Scott and Mr. H. Jameson. 5. Mr. and Mrs. R. Cussins and Mr. and Mrs. H. A. Bamber. 6. Mr. L. J. Mason, Mr. and Mrs. I. G. Floyd, Mrs. Mason and Mr. and Mrs. N. H. Sheppard. 7. Mr. and Mrs. H. G. Lilley. 8. Messrs. H. A. Partridge and C. H. Alger. 9. Mr. J. Smellie, Mrs. C. J. Scott, Mr. J. Y. Dick, Mrs. Smellie, Mr. T. Counter and Mrs. Dick. 10. Mr. and Mrs. P. B. Etheridge, Mr. and Mrs. G. Conradi and Mr. and Mrs. F. J. Blackwell. 11. Mr. and Mrs. K. S. Estlin of floor screed and he also referred to three-phase floor-warming installations. Mr. Jackson replied to the questions put by Mr. Blanshard and subsequent speakers, including Messrs. C. King, A. S. Redvers Pratt, H. Bamber, T. F. Pitts, R. J. Griffin, C. W. Edwards, J. Nield, H. W. Evans and E. A. Cattle. Matters dealt with related to the loss of heat downwards, the operating temperatures of cables, the ability of plastic insulation to withstand high temperatures, withdrawable and embedded systems, the application of floor warming in existing buildings of conventional construction, the effects of ventilation, and temperature control. A fuller account of the discussion will be published in next week's issue. The author was thanked by the President.

New President

After a brief interval Mr. Stock introduced his successor, Mr. C. R. Waterhouse (Sheffield), in felicitous terms and handed over the badge of office. In a brief address Mr. Waterhouse referred to the Association's activities on behalf of its members for sixty years and asked the members for their support during his year of office.

Mr. Stock then proposed the customary vote of thanks to the authors, the Scarborough Corporation, Mr. L. C. Penwill and his staff and all those who had helped to make the Conference a success. This concluded the business side of a Conference which was well up to the standard of its predecessors.

In the evening Mr. and Mrs. Stock held a reception at the Spa Ballroom and dancing followed.

World Power Resources

THE Statistical Year Book of the World Power Conference (Vol. 9), edited by F. Brown, B.Sc. (Reader in Commerce, London University), published at £3 10s, on behalf of the Central Office, W.P.C., by Percy Lund, Humphries & Co., Ltd., 12, Bedford Square, London, W.C.1, is now available. It contains tabulated data with explanatory text by the editor for each year from 1954 to 1957, as revised where necessary, and for 1958 when information is available, concerning the different countries of the world. Particulars given relate to annual production and consumption of electricity and to all species of solid and liquid fuels and of water power resources with their states of development. There are also figures regarding the area and population in each instance. In future the collection and publication of annual statistics is to be undertaken by the United Nations, but as from 1962, when the next plenary World Power Conference will meet in Melbourne, the first of a series of surveys of energy resources is projected by the W.P.C. to be followed by others at the six-yearly intervals between its plenary meetings.

Runway Lighting

A NEW publication, B.S. 3224, "High-Intensity Elevated Runway Lighting Fittings," is one of a series specifying requirements for the form and performance of such fittings. It applies to fittings used for lighting runways at civil land aerodromes, suitable for use on systems with a voltage not exceeding 50 V r.m.s. to earth. Copies may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 4s.

1. The Mayor and Mayoress of Scarborough with Mr. and Mrs. V. J. S[illegible] and Mr. and Mrs. L. C. Penwill. 2. Mr. and Mrs. S. F. Steward. 3. Mr. and Mrs. J. C. Most[illegible] and Mr. T. E. Daniel

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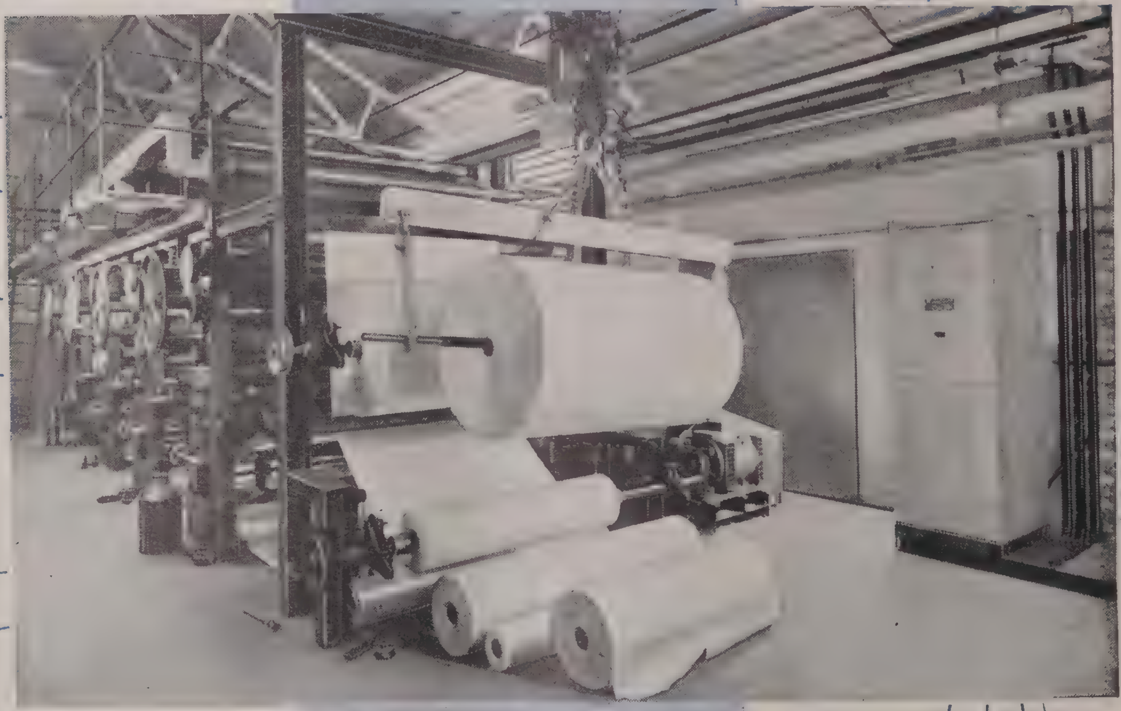

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Right: Continuous chrysanthemum production at the nurseries of G. A. Bailey, Ltd., at Martham, Norfolk. Arrangement of 100 W lamps over beds just after planting out

Below: Leaf cuttings of begonia rex on an electrically-warmed bench at Keith Luxford's nurseries. Some of the peat has been removed to show arrangement of heating wires

PLANNED PRODUCTION WITH ELECTRICITY

LIGHT AND WARMTH IN HORTICULTURE

By E. C. CLAYDON, N.D.Agr.E., M.I.Agr.E.*

THE grower of horticultural produce, like the farmer, has always been at the mercy of the weather and the seasons. These two factors have meant that production has had to be confined within severe limits to achieve an acceptable degree of economy and efficiency. To take the principal crop, tomatoes, for instance, it has not been found possible to undertake continuous production because of the shortage of light during winter months. The gap has, therefore, had to be made up with chrysanthemums or some other crop.

The introduction of several crops to achieve year-round production poses problems of management and marketing which could be avoided if it were possible to produce one crop continuously. Batch production always leads to labour peaks and valleys. A good load factor, therefore, is as important to the grower as to the supply engineer. Like electricity, many fresh fruits, vegetables and flowers cannot be stored, at least not without the aids which electricity can give.

Much has been done to secure an even flow of goods by providing cold storage facilities for both plants and fruit. The introduction of thermostatic control, forced draught and circulating pumps has so increased heating efficiency that the production season of a plant can be extended or modified. It is, however, only recently that full advantage has been taken of the new techniques made possible by electricity so that continuous production of a single crop can be achieved.

The effects of light on plants have been studied for many years and it has been found that there is a response not only to the quantity of light but to its daily duration. This has been taken advantage of in a very practical way for the continuous production of chrysanthemums. At first it was thought that the flower trade would not take kindly to this innovation but the reverse has proved to be the case. The break from traditional methods, however great the apparent advantages, takes a good deal of courage and enthusiasm. These qualities are to be found in the brothers who make up the firm of G. A. Bailey, Ltd., Martham, Norfolk, which has recently changed over to the continuous production of chrysanthemums.

So far as the use of electricity is concerned, the principal feature of the new growing technique is the provision of a broken night during the winter months to initiate bud formation and promote flowering. This is achieved by mounting standard, 100 W, single-coil filament lamps in festoon holders on t.r.s. cable 6ft apart and 4ft 6in high above the chrysanthemum beds. An intensity of some 5 lumens/sq ft is thus provided and the lamps are controlled by a time switch. Four 10 kW sets of lamps are provided at Martham to deal with thirteen houses, the sets being moved from house to house as needed. The duration of the night " break " varies from five hours in December and January to two hours in April and September and takes place between the hours of 10 p.m. and 3 a.m. There is at the Martham nurseries, as has been shown, a total loading of 40 kW and it is anticipated that the annual consumption will be in the region of 38,000 kWh, all well off peak.

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* Agricultural Engineer, Eastern Electricity Board.

Planned production of a different kind is being carried out at Keith Luxford's nurseries, Sawbridgeworth, Herts. Here a large block of glasshouses has been converted for the propagation of "house" plants. The first requirement here was a heating system capable of maintaining a temperature in the region of 60°F under all conditions. This was achieved by providing thermostatically-controlled, high-speed, small-bore pipe systems with forced-draught boilers and circulating pumps. Long rod-type thermostats were used to control temperatures within narrow limits.

Propagation takes place on electrically-heated benches 100ft long and 6ft wide. These are made up from corrugated asbestos sheeting with wooden sides and are covered by glass or plastic frames. Peat fills the corrugations of the base and the warming wires are laid directly on this. A further layer of peat provides the warm bed on which the trays and boxes of cuttings are placed. Contrary to usual practice, no sand bed is provided but the propagator, Mr. R. Niemann, is perfectly happy with the results. The loading of the beds is some 12 W/sq ft and the warming wires, which are plastic covered to resist corrosion, run at 22 V from totally-enclosed oil-filled transformers. Thermostatic control is provided and the operating temperature can be as high as 85°F when required. Each bed is responsible for the consumption of thousands of kWh per annum.

The layman cannot help being fascinated by the ease with which a wide range of plants is propagated under these conditions. Such subjects as begonia rex can be produced in abundance from leaf sections less than the size of a postage stamp, whilst other plants such as the dieffenbachia are grown from what appear to be short lengths of dead stem laid on the surface. "Controlled rooting temperature is the secret," says Mr. Niemann who came over from Germany with the original plant stocks and has since made his home here. Output of the nursery can be judged from the fact that of one plant alone, the popular aphelandra, over 40,000 a year are sent out.

These two nurseries show how the whole character of rural electrification can be changed once new ideas and techniques are adopted by the horticultural industry. The possibilities for the supply authority of load factor improvement and off-peak development are considerable.

E. R. A. REPORTS

THE proportions of ethylene and air in the mixture which is most readily ignited by the spark from an inductive circuit have been determined and are given in Report Ref. D/T106, "Intrinsically Safe Electrical Apparatus: Relation of Igniting Current to Inductance for a Mixture of Ethylene with Air," by E. R. Wooding and F. Shaw, price 6s. The relationship between the minimum igniting current and the inductance in a circuit has been examined and it has been shown that ethylene is more easily ignited than pentane or carbon monoxide, but less easily ignited than coal gas or hydrogen. The work was carried out by the Safety in Mines Research Establishment.

Switching Transients

The Report Ref. G/T319, "Switching Transients Measured on the Live 132 kV System. Comparison with Network Analyser Results," by J. S. Vosper, price 15s, gives results of measurements of transient voltages associated with the interruption of short-circuit currents during a series of tests made at the 132 kV substation at Cliff Quay in August, 1956. Important details of the 50 c/s recovery voltage waveform are discussed in relation to their effect on estimates of restriking voltage characteristics in certain cases. The method of representation on the E.R.A. network analyser is described and the agreement between live test and analyser results is indicated.

Protecting Insulators from Arc Damage

The third stage in an experimental investigation at Queen Mary College (University of London) into the effects of power-follow-through arcs on high-voltage insulators and the protection given by arcing fittings is given in Report Ref. O/T23, "The Protection of 11 kV and 33 kV Line Insulators from Damage by Power Arcs," by A. E. Guile and S. F. Mehta, price 12s. The previous stages of the investigation have been described in reports which dealt with arc movement under magnetic and wind forces, Ref. O/T19, and with bushing protection, Ref. O/T20. The present report describes tests on various types of pin, post and disc insulators for 11 kV and 33 kV systems and on 33 kV bushings fitted with duplex gaps. The tests show the conditions under which damage can occur and the ways in which protection can be given, so that they provide information which can be applied to larger insulators of similar types. The appendix deals with the current magnitude and duration at which toughened glass discs were found to fracture and with the burning away of arcing horns.

Aluminium Busbar Joints

Details of an examination into the variation in contact resistance with contact pressure for aluminium and aluminium alloy busbars are given in Report Ref. Z/T118, "Joints in Aluminium and Aluminium Alloy Busbars. Experiments on Contact Resistance," by A. P. Singh, price 12s 6d. Various surface preparations were used including abrasion under petroleum jelly, tinning, silver plating and coating with patented jointing compounds. The effect of temperature on joint resistance was also examined. Copper busbar joints were examined mainly to act as a standard of reference for the aluminium bars. It was found that rolled aluminium bars gave a lower joint resistance than extruded bars and they were used for the majority of the experiments.

Limited supplies of these reports are available from the Publications Sales Department of the Electrical Research Association at Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

MULTIPLE-UNIT STOCK FOR BRITISH RAILWAYS

Diesel-Electric Pullman Trains

ONE of the five diesel-electric Pullman trains for service in the Western and London Midland Regions of British Railways was demonstrated yesterday (Thursday). Commencing on 4th July the trains will run between Manchester and London and Leicester and London in the Midland Region, while the Western Region trains will operate between London and Bristol and on the London-Birmingham and Wolverhampton route.

Three of the new trains are composed of eight vehicles and two of six vehicles. The six-coach trains are first class only, while the eight-coach sets provide both first and second class accommodation. All have a power car and driving cab at each end, the traction equipment in both cars being controlled simultaneously from either cab over a control line running through the train. At each end of a train formation there are two traction motors in the inner bogie of the power car and two in the adjacent bogie of the vehicle coupled next to it, making eight motors in a train of either six or eight coaches. All power cars have a luggage and guard's compartment and a passenger section beyond the engine room and all formations include two kitchen cars. For this project the General Electric Co., Ltd., has supplied ten main power equipments comprising diesel engines, generators, traction motors and drives and control gear for installation in rolling stock designed and built by the Metropolitan-Cammell Carriage & Wagon Co., Ltd. The diesel engines and accessories were supplied by the North British Locomotive Co., Ltd. The equipments are designed for a maximum service speed of 90 m.p.h.

Access to the machinery compartment from the driver's cab is obtained past the radiator unit

Immediately behind the cab in each power car is a Serck radiator unit housing the cooling elements for the engine water, the lubricating oil heat exchanger and 45in diameter fan. Beyond the radiator unit is the engine-generator set, consisting of a N.B.L./M.A.N. engine rated at 1,000 h.p. at 7,500 r.p.m., with 12 cylinders in V-formation, direct-coupled to the main 650 kW, 383/525 V six-pole generator with an overhung 10 kW, 110 V auxiliary generator. A bulkhead separates the engine from the generators. In the generator compartment there is a main traction control switchgear cabinet with traction motor field divert resistors mounted on top, while the generator automatic field regulator resistances are in the compartment roof. A small cabinet containing auxiliary switchgear is accommodated in a short passageway giving access to the adjacent guard's and luggage compartment.

The main generator armature winding is of duplex lap form which is considered to give the best commutation conditions for this particular application, since it results in moderate values of both reactance voltage and voltage between commutator segments. The field windings of this machine follow conventional traction practice, consisting of separately-excited and self-excited main fields with a series de-compounding winding, which also forms part of the series excitation for motoring the generator when starting the diesel engine. The voltage output of the auxiliary machine is controlled over the whole engine speed range by a Newton carbon pile voltage regulator. This generator supplies excitation for the main generator separately-excited field and current for battery charging, control circuits, compressor and oil priming pump motors and cab heating. Cab lights and marker lights are supplied at 24 V d.c. via transformer-rectifier units from diesel-driven alternators installed in the trains for air conditioning, train fluorescent lighting and other auxiliary services. A 110 V driver's cooker with three-heat switch is provided in each cab.

The traction motors are four-pole, self-ventilating machines with a rating of 199 h.p. at 1,360 r.p.m., being supplied with 425 A at 383 V. The two motors in each power bogie are in parallel. Those in the second vehicle from each end of a train are supplied through power cables from the adjacent power car, their field divert resistors being adjusted to allow for the voltage drop in the cable connections. These trains are the first diesel units on British Railways to have fully springborne traction motors, a Brown Boveri spring drive being employed.

Control Scheme

Basically, the control method consists of selecting eight different engine speeds between idling and 1,500 r.p.m., at each of which the corresponding output is available over a wide range of train speeds by the action of a governor-controlled generator field regulator, supplemented in the appropriate conditions by one step of traction motor field diversion. On the first two power positions of the controller the engine runs at idling speed and generator excitation is controlled by fixed resistance steps. On notch 3 the automatic regulator becomes operative with the engine still at idling speed and remains in action on the remaining seven notches, on each of which the engine speed and output are increased in graded steps. Engine speed control is effected by the action on the governor of three solenoids which lift in different combinations according to the energisation through the master controller contacts. This method provides exactly synchronised control of the power units at both ends of a train.

The servo regulator is mounted above the main and auxiliary generators

Control equipment cubicles are also housed in the machinery compartment

Load Regulation

The automatic load regulator takes the form of an oil-operated vane motor driving rotatable brushgear round a fixed commutator, the segments of which are connected to the regulating resistances in the main generator separately-excited field circuit. When the generator load varies with the track conditions, it tends to alter the speed of the diesel engine. This causes the governor to move and maintain constant speed conditions by admitting oil to the vane motor so that it rotates in the direction necessary to decrease or increase the generator excitation. Field weakening of the traction motors takes place in the appropriate conditions under the control of a transition relay in the generator field circuit. When this operates, the load regulator moves back towards minimum excitation and the weak-field contactors close when the generator voltage and current have been adjusted to the correct values. Full field is restored automatically when appropriate by transition current relays in one motor circuit of each power unit.

A current-limiting relay arrests the increase of generator excitation by the automatic load regulator during train acceleration if the current exceeds a predetermined setting. When the current falls with rising train speed to the relay drop-out value, the excitation increase is resumed under the normal control of the load regulator. This relay ensures that wheel slip is avoided when accelerating under poor adhesion conditions.

In addition to the power handle, the master controller has a selector handle with "forward," "engine start," "off" and "reverse" positions and the usual interlocks are provided. All power contactors are electro-pneumatic. The reverser consists of two air-operated cam groups. A master motor cut-out switch with cam-operated contacts is located at the side of the traction switchgear cabinet and enables the traction motors to be isolated singly or altogether. Warning lamps in the generator compartment brighten to indicate low water level, high water temperature, low oil pressure, overload and earth fault. The engine is slowed automatically to idling in the event of high water temperature, overload or earth fault, the last-named also disconnecting the main generator's separately-excited field from the auxiliary supply and introducing a discharge resistance by a change-over contactor. Two indicator lamps on the driver's instrument panel brighten to show engine stopped, or a general alarm, in either power car.

The only auxiliary machines are the oil priming pump motor and the motor driving the compressor for the Westinghouse automatic electro-pneumatic brake and control air supplies. Eight cables connected between the main and auxiliary power cars at each end of the train supply the traction motors. The 36-line control cable running throughout each train is conveyed between coaches by jumpers and receptacles with butt contacts. This form of receptacle avoids difficulties experienced with plug and socket types when plugs become misaligned, and is being supplied in quantity for multiple-unit electric stock under the 50 c/s electrification programme.

RAILWAY ELECTRIFICATION CONFERENCE

ARRANGEMENTS for the British Railway Electrification Conference, which is to be held at the Institution of Civil Engineers from 3rd to 9th October next, were reported in our issue of 25th March last (page 579). We have now received more detailed information of the programme arranged. Some 200 railway engineers from abroad will attend and during the preceding week as well as in the week afterwards, the visitors will be shown railway equipment in production at the works of various manufacturers who are suppliers to British and overseas railways. These visits will supplement the exhibition of manufacturers' equipment which is being staged at Battersea Wharf, London, concurrently with the conference. This exhibition will be opened by the Minister of Transport.

The formal opening ceremony on Monday (3rd October) will be under the chairmanship of Sir Brian Robertson, chairman of the British Transport Commission. The Commission will give a luncheon for the guests at the Savoy Hotel after the opening session, and there will be a Government reception at Lancaster House that evening.

On Tuesday (4th October) delegates will begin the discussion of some forty technical papers which have been prepared by leading experts on both British Railways and the staffs of British manufacturers. On Wednesday (5th October) delegates will leave Euston by special train for Manchester, when they will have the opportunity of seeing the newly-electrified lines between Manchester and Crewe. From Manchester they will travel by electric multiple-unit train to Crewe and visits will be made to the new power signal box at Wilmslow and to the electrification depot at Crewe.

The discussion of technical papers will be concluded on Thursday (6th October) at an all-day conference, the proceedings ending with a film show in the Great Hall of the Institution of Civil Engineers. Two special trains will take delegates from Liverpool Street on Friday (7th October) for an all-day inspection of selected features of the electrification schemes and associated engineering works now completed or in hand in the Region. The programme will include a visit to the electric train servicing and maintenance depot at Ilford. In the evening the delegates will be entertained at the Guildhall, London, by the British Electrical and Allied Manufacturers' Association and the Locomotive and Allied Manufacturers' Association of Great Britain which are jointly, with the British Transport Commission, the sponsors of the conference programme.

The exhibition of new electric locomotives, rolling stock and a.c. electrification equipment will be the most comprehensive display of its kind yet staged in Britain. It will be opened by the Minister of Transport on 3rd October, following the opening of the conference. Although primarily of interest to railway and electrical engineers, it will be open to the public after the first day. Some exhibits will be of interest to railway enthusiasts as well as to traction engineers. One example is a model railway layout along which will run a model of a Bo-Bo 25 kV a.c. locomotive, the passage of which will operate four-aspect colour light signals in their correct sequence. A traction motor to be exhibited can be arranged to operate on the latest a.c. system or on earlier systems, thus allowing dual operation across frontiers between areas using two different electrification systems. Other exhibits will include large concentric oil-filled cables for the transfer of electric power from the 132 kV national grid to the British Railways feeder stations; switchgear specially designed for the control, protection and distribution of trackside electricity supplies on the 25 kV a.c. system; pantographs for the collection of current from the overhead lines; air-blast circuit-breakers to be accommodated in the roof structures of locomotives to control the incoming electricity supply from the 25 kV system; and power couplers to convey high-voltage electricity safely and effectively from car to car throughout a train.

Conductor Material Resistivity

THE methods of determining resistance and resistivity to be used in reference and routine tests on metallic conductor materials are prescribed in B.S. 3239 : 1960. The accuracy of the reference method is as high as can be expected under laboratory conditions, and that of the routine method sufficient for most practical purposes. It is intended that the reference method should be used in any case of dispute. An appendix to the 20-page standard explains the use of various temperature coefficients of resistance and resistivity. Copies may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 5s.

NEW ELECTRICAL EQUIPMENT

Semiconductor Rectifiers

Following the medium-area range of silicon junction rectifiers which have been produced by the Electronic Apparatus Division of ASSOCIATED ELECTRICAL INDUSTRIES, LTD., Carholme Road, Lincoln, for several months, a new range of finned assemblies is now available for duties up to 10 A. The rectifier cell is stud mounted and, on a suitable cooling fin, provides the maximum forward current of 10 A with a maximum peak inverse voltage range from 100 V to 400 V. Assemblies mounted on 3in square cooling fins are available as single-phase half-wave types and single- and three-phase full-wave bridge types, with a maximum peak inverse voltage up to 1,200 V and an output current up to 24 A.

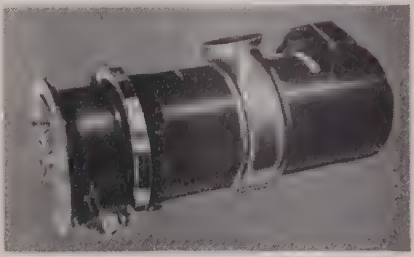
Meter Control Equipment

The on/off control equipment now being produced by MEASURING INSTRUMENTS (PULLIN), LTD., Electrin Works, Winchester Street, Acton, London, W.3, has been designed for use in conjunction with a standard meter which can have a full scale sensitivity as low as 20 μA, 4,500 Ω. No extra loading is placed on the conventional moving coil movement by the flag at the pointer tip which interrupts a light beam directed on to a small photo transistor. This operates a relay having contacts rated at 3 A, 200-250 V a.c. and provides double-pole change-over switching. The accuracy of the instrument is in accordance with B.S. 89/54, and the control sensitivity approximately ±1 per cent. The present designs cover an up sensing controller with no overtravel and with the preset control point at approximately full scale, and an alternative design having a preset control point at 5 per cent of full scale for a down sensing operation, also with no overtravel. Both can be incorporated in the one case if required. The circuit is arranged to fail safe should the a.c. supply be interrupted or the lamp burn out, as the relay is continuously energised except when the flag interrupts the light beam.

Constant Speed Alternators

Following a licence agreement with Précision Mécanique Labinal, Paris, the PLESSEY CO., LTD., Ilford, Essex, is now starting to manufacture a range of aircraft constant speed alternators. Machines have been developed over the power range 4-19 kVA and units of up to 35 kVA are currently being investigated. The 4 kVA unit in this range is designed to operate at altitudes of up to 55,000ft with forced draught cooling and will withstand accelerations up to 15 g in all directions.

The machines will embody the "Labamatic" principle of constant frequency control, based on an electromagnetic coupling incorporated in the drive to the alternator shaft. Constant rotor speed is maintained by controlling coupling slip by an amplifier system and a frequency sensitive network. The electromagnetic coupling may be employed in conjunction with a variety of gear drive arrangements, in some cases including a two-speed gear box. With this addition, an engine speed range of 3½ : 1 may be permitted.



Plessey 4 kVA aircraft alternator

The first machine to go into production is a 4 kVA, 208 V, 400 c/s unit having a unity to 0·75 lagging power factor. When this alternator is coupled to a drive ranging from 2,900 to 8,000 r.p.m., the output voltage is maintained constant to within ±2·5 per cent and the frequency to within ±2 per cent. Overspeed is permitted up to 9,000 r.p.m. for short periods. An electrically-operated automatic two-speed gear box is fitted as standard. Magnetic amplifier circuits are used throughout the control system and protection is provided against under- and over-voltage, under-frequency and earth faults. The total weight of the machine, with frequency regulator, voltage regulator and protection unit, is 72 lb. In an alternative form without the automatic two-speed gear box, the machine is suitable for drive shaft speeds of from 4,700 to 8,000 r.p.m. and the total weight is then reduced to 64 lb.

Lamp Shapes and Sizes

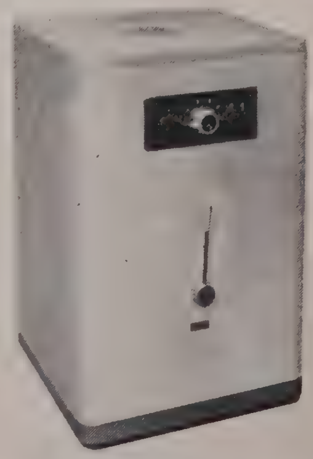
A new range of mushroom-shaped lamps called the Ascot "Diplomat" have been introduced by ASCOT LAMPS & LIGHTING, LTD., Arcola Street, London, E.8. The lamps are available in 40, 60, 75, 100 and 150 W sizes, incorporating a high-efficiency coiled-coil filament in 200/210, 220/230, 240 and 250 voltage ratings. All sizes have twin glass-encased fuses and a moulded neck seal and are subjected to the Ascot "twice-in-24-hour" test. They are intended to replace the present Ascot "Whitelight" range, and the prices, with purchase tax, are 40 and 60 W (1s 8½d); 75 and 100 W (1s 11d); and 150 W (2s 10d).

An announcement from the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, states that "Osram" 75 and 100 W coiled-coil lamps are now being made with bulbs of 60 mm diameter. This latest step towards a standard bulb size means that all "Osram" pearl and clear coiled-coil lamps have 60 mm bulbs.

The bulb and cap temperatures of the new lamps will be similar to those of single-coil lamps of equivalent wattages in 68 mm bulbs. There will not be any alteration in the bulb size of single-coil lamps. Coiled-coil lamps with the new size bulbs will be on the market in July.

Washing Machine/Spin Dryer

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, announces that its "Double-Plus" combined washing machine/spin dryer has now been launched nationally. The machine, which was originally introduced in the North and Midlands only, is only 21in wide by 24in deep. In order to accommodate the spinner drum in a cabinet machine of this size, the wash-tub is of an unusual shape with two pulsators mounted in the bottom. Advantages claimed for this shape of tub are that the clothes



G.E.C. "Double-Plus" combined washing machine and spin dryer are actively washed as there are no dormant corners. The tub is vitreous enamelled and the spinner drum, which is tapered, is unperforated. The machine is fitted with a 3 kW heater and the maximum water load is 11 gal. The price, including purchase tax, is £83 9s 6d. A table top in a choice of three colours is also available, price £3 5s, including purchase tax in the United Kingdom.

Industrial Polisher/Scrubber

A two-brush polisher/scrubber suitable for use in factories, hospitals, schools, etc., has been produced by TRUVOX, LTD., Neasden Lane, London, N.W.10. The new machine, the "Husky," is fitted with two 8½in contra-rotating brushes, and will polish, buff, scrub, and scarify. Special holders are available for use with "Scotch-Brite" polishing, stripping, and scrubbing pads. The transit wheels are 6in in diameter and fitted with non-marking white rubber tyres. If the handle is dropped while the machine is in use, a braking action is applied. The machine is fitted with 50ft of 2-core heavy duty cable and is doubly insulated to B.S. 2754 : 1956. It is driven by a ½ h.p. heavy duty capacitor start motor.

Truvox "Husky" industrial polisher/scrubber

For use in wet scrubbing a 2 gal fibreglass tank is fitted on the machine. The weight of the tank and water assist in the scrubbing operation and the water supply is varied by a simple control. The motor and brushgear casing are of die-cast aluminium alloy finished in hammered silver-grey, the handle and switch box are in black nylon, and the buffer is of grey rubber. The voltage range is 200/220 or 230/250 V a.c.

The weight, as a polishing machine, is 60 lb and as a scrubbing machine, with full water tank, 80 lb. The machine is priced at £59 as a polisher complete with two polishing brushes and two felt pads, or as a polisher/scrubber with the water tank and base at £68 plus £2 8s for scrubbing brushes.

Panel Mounting Instruments

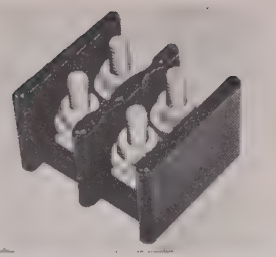
A range of panel mounting instruments in 2in, 2½in, 3½in and 5in sizes has been introduced by SALFORD ELECTRICAL INSTRUMENTS, LTD., Silk Street, Manchester, 3. The units can be supplied for all a.c. and d.c. measurements of current and voltage. The basic movements offered are of the moving coil permanent magnet type for all d.c. purposes, moving coil rectifier type for a.c. use over a wide frequency range, moving coil thermocouple type for d.c. and a.c. up to radio frequencies and moving iron repulsion type for d.c. and a.c. use. All types comply with the requirements of B.S. 89 for industrial grade instruments and are tested at 2,000 V a.c. for 1 min between terminals and any exposed metal parts on the case. All standard moving coil and moving iron instruments are capable of withstanding momentary overloads of 1,000 per cent and severe vibration. In the case of rectifier and thermocouple types, the maximum overloads are 100 per cent and 50 per cent respectively.

Floor Warming Cables

The range of floor warming cable manufactured by AERIALITE, LTD., has been extended so that loadings are available in multiples of 100 W, from 800 W to 3·8 kW. All cables are now supplied with polythene insulated and p.v.c. sheathed cold tail terminations, in compliance with B.S. 1557/1954. A full range of fixing accessories, control gear and thermal insulation materials is available together with a monitor test set, which can be hired or bought and which should be used when the cable is being laid. Further details are available from the company at Castle Works, Stalybridge, Cheshire.

Terminal Block

The heavy duty barrier terminal block type TER announced by the ELECTRICAL REMOTE CONTROL CO., LTD., The Fairway, Bush Fair, Harlow, Essex, has overall dimensions of 2⅜ by 2⅛ by 1⅝in high. It consists of a black insulating moulding with two pairs of $\frac{5}{16}$in Whitworth nickel plated brass screws connected by ⅝in wide by ⅛in nickel plated copper strips. The block can be used on circuits not exceeding 650 V and the recommended current rating is 100 A. The breakdown voltage between terminals is 7 kV r.m.s. and between the terminals and threaded inserts in the base 6 kV r.m.s.



Type TER terminal block (Electrical Remote Control Co.)

Wire Cutter

A simple wire cutter of American manufacture, the "Little Snipper," is now available in this country from the sole agents, J. B. HYDE & CO., LTD., Dale Street, Broadheath, Altrincham, Cheshire. The cutter consists of a tube mounted in a pistol grip handle and a shaft within the tube is rotated by a thumb operated lever. The cutting edges at the end of the tube and shaft can shear up to 16 s.w.g. copper wire or stranded wires of equivalent overall diameters. Six models are available with shaft lengths from 2 to 18in.

Induction Heater

A recent addition to the range of induction and dielectric heaters made by the INDUCTION HEATING EQUIPMENT CO., 11, Molesey Road, Hersham, Walton-on-Thames, Surrey, is the model 25. This has an input of 2·5 kW at 200-250 V single-phase a.c. and an output in excess of 1 kW at 400 kc/s. It is designed specifically for outgassing and gettering for the radio valve industry but is also suit-

Induction Heating Equipment Co.'s model 25 heater able for brazing and heat treatment of small parts. The generator may be bench mounted or alternatively can be supplied mounted on a trolley containing a water recirculating unit making a compact mobile unit. The price is £385.

Portable Thermometer

A portable instrument for the measurement of temperatures in solids, liquids or gases, and suitable for use for rapid, accurate measurement of ambient or static temperatures, the "Mavotherm," is manufactured by P. Gossen of Germany and distributed in the United Kingdom by AVELEY ELECTRIC, LTD., Ayron Road, Aveley Industrial Estate, South Ockendon, Essex. The instrument is operated from a 1·5 V battery, which under normal load conditions will last for nearly a year. It has two ranges—−20 to +90°C and +90 to +200°C. Two calibrated probes specially designed for easy access to difficult positions are supplied, and the whole instrument is contained within a strongly made plastic case. Reading time is between 3 and 4 sec and the instrument is accurate to ±2°C.

Vapour Cooled Valve

The 50 kW type BY194 power triode introduced by the ENGLISH ELECTRIC VALVE CO., LTD., Chelmsford, Essex, may be used in r.f. heating applications where vapour cooling is advantageous. Such applications involve operating conditions where heavily dirt-laden air makes filter cleaning prohibitive and in localities where water is expensive, scarce or otherwise unsuitable.

The valve anode is positioned in a tank of water and heat generated by the anode boils the water at atmospheric pressure, the steam being subsequently condensed. In certain applications, where a small quantity of water may be run to waste, compact units combining a boiler and condenser in one tank are available. The filament voltage and current are 13 V and 240 A, the peak usable cathode current is 100 A, and the amplification factor is 34. At 5 Mc/s the maximum anode voltage is 15 kV and 10 kV at 30 Mc/s, and the maximum anode dissipation is 50 kW. The valve has a thoriated tungsten filament.

Hopper Level Switches

Two types of diaphragm hopper level switches have been developed by FIRTH CLEVELAND INSTRUMENTS, LTD., Stornoway House, Cleveland Row, St. James's, London, S.W.1, to shut off the flow of granular or semi-solid material into a hopper, bunker or silo, when the level of the material reaches a height predetermined by the mounting position of the switch. Type HS 1017/1 is recommended for open hoppers, type HS 1017/2 is for pressurised hoppers. The switch consists of an aluminium-alloy housing mounted on the hopper wall, the inside face being sealed by a synthetic-rubber diaphragm. When the material presses against the diaphragm a spring-loaded plunger actuates a standard single-pole changeover micro-switch.

To prevent spurious operation of the switch when fitted to pressurised hoppers, the air pressure in the hopper is fed to the back of the diaphragm, which becomes self-balancing.

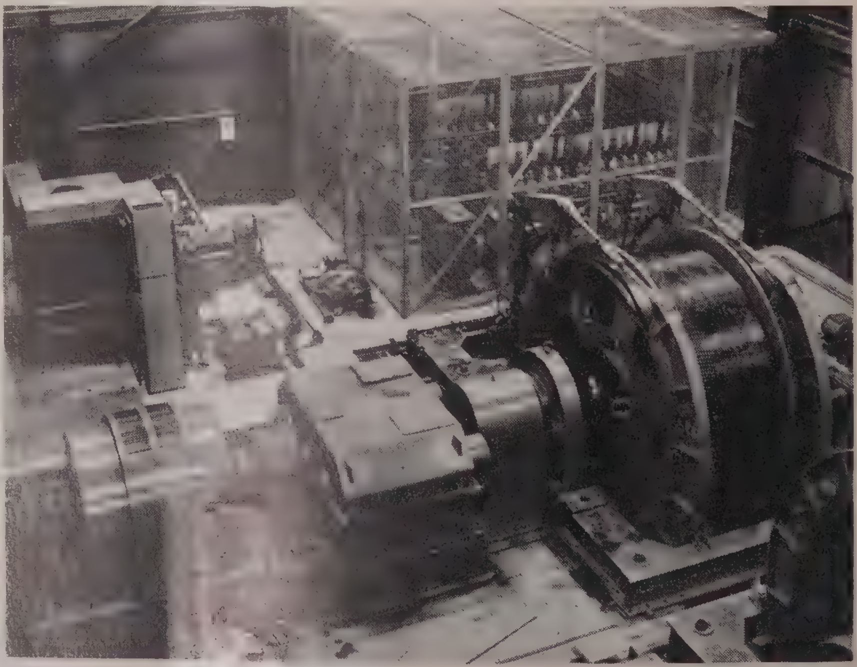
Convector Heater

A. J. FLATLEY, LTD., Kingston Mill, Cobden Street, Pendleton, Salford, 6, manufacturers of clothes dryers and washing machines, have now entered the electric heater market with the introduction of a low-priced convector heater. This has a loading of 1 kW and is constructed of sheet steel with insulated feet and carrying handle. It will be available in a range of three colours—bronze, beige and silver grey—with a hammer finish. The heater, which was originally to be marketed at £4 15s, will be offered temporarily at a special price of £2 19s 11d.

Flatley 1 kW convector heater

Dual-Purpose Mine Winders

Four dual-purpose tower-mounted mine winders have been supplied by the Heavy Plant Division of Associated Electrical Industries, Ltd., for the National Coal Board's Kellingley Colliery in Yorkshire. Two of these, each driven through a coaxial reduction gearbox by a 1,100 h.p. a.c. motor, are in use in No. 1 tower as drum winders for sinking the shaft, which will eventually be 2,400ft deep. When coal production begins, they will be employed as four-rope friction winders, with push-button control. The two other winders, twice as powerful, in No. 2 tower will also be used both for shaft-sinking and raising coal. Each of these winders will be driven through a twin-input gearbox by two 1,100 h.p. motors. On all four winders dynamic braking is used, so that the mechanical brakes are needed only to bring the cage to rest. Power is supplied to the motors directly at 11 kV.



One of the A.E.I. 1,100 h.p. winders in No. 1 Tower at Kellingley Colliery

We could electrify you !

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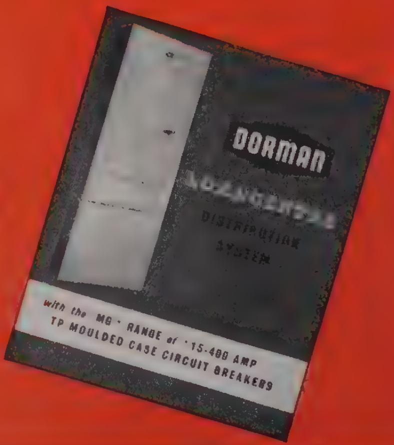
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Revised Nuclear Power Programme

SEVEN STATIONS WITH A TOTAL CAPACITY OF 3,000 MW BY 1966

UNDER the revised nuclear power programme announced in a White Paper* on Monday, the total output capacity of nuclear plant in operation by 1966 will be 3,000 MW. This compares with the estimate of 5,000-6,000 MW given in the previous White Paper published in 1957, and the original (1955) estimate of 1,500-2,000 MW. The 3,000 MW in the new programme will be provided by seven stations. Five of these are already being built and orders for the other two, at Dungeness and Sizewell, will be placed in "a few weeks" and "later this year," respectively.

To reach a capacity of 5,000-6,000 MW by the end of 1966 it would be necessary for the electricity authorities to place exceptionally large orders in the next two years. The need for such an acceleration on fuel supply grounds has passed. The nuclear programme has therefore been examined by the electricity authorities in consultation with the Atomic Energy Authority and the Government in the light of these changes and of the latest estimates of nuclear and conventional costs and the future availability of primary fuels to meet our growing energy needs.

It is pointed out that in the long run increasing supplies of nuclear power will be needed. In about ten years' time it should be cheaper to generate base load in nuclear power stations than in conventional stations provided that we achieve the technological progress that is expected. To secure this, it is necessary to continue to build nuclear stations on an adequate scale.

"In these circumstances," the White Paper states, "the national interest will best be served by continuing, for the time being, to place orders for nuclear stations at the rate of roughly one every year. The capacity of individual stations is likely to increase, so that the effect of this decision should be a steadily-rising rate of nuclear commissioning which should give the country about 5,000 MW of capacity in 1968. Compared with the 1957 programme, and after allowing for more conventional stations, it is estimated that this rate of ordering will reduce by some £90 million the cost of power stations to be commissioned during the next seven years. There will, however, be some loss to the Atomic Energy Authority due to arrangements already entered into for the supply of fuel and for processing it.

"The proposed rate of ordering means that at any time there should be five or six stations in various stages of development from design to commissioning. This should fully sustain a nuclear plant industry capable of competing for overseas business and of expanding to meet the high level of our own future needs."

Speaking at a Press conference, Mr. Richard Wood, Minister of Power, and Sir Christopher Hinton, chairman of the Central Electricity Generating Board, both emphasised that the effect of this move on the consortia was one of the most important factors considered. Sir Christopher added that "the Generating Board never considered it part of their business to tell industry how to organise itself. We are now letting industry know what volume of orders we shall be placing so that they can organise themselves in the way they think right to meet that volume of trade." It was impossible, he said, to contemplate any time when nuclear stations could compete on a peak load basis, but the base load in 1970 would be about 6,000 MW and would continue to grow "at about the rate that nuclear stations are installed."

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* Cmnd. 1083, H.M. Stationery Office, price 4d.

CONSULTING ENGINEERS

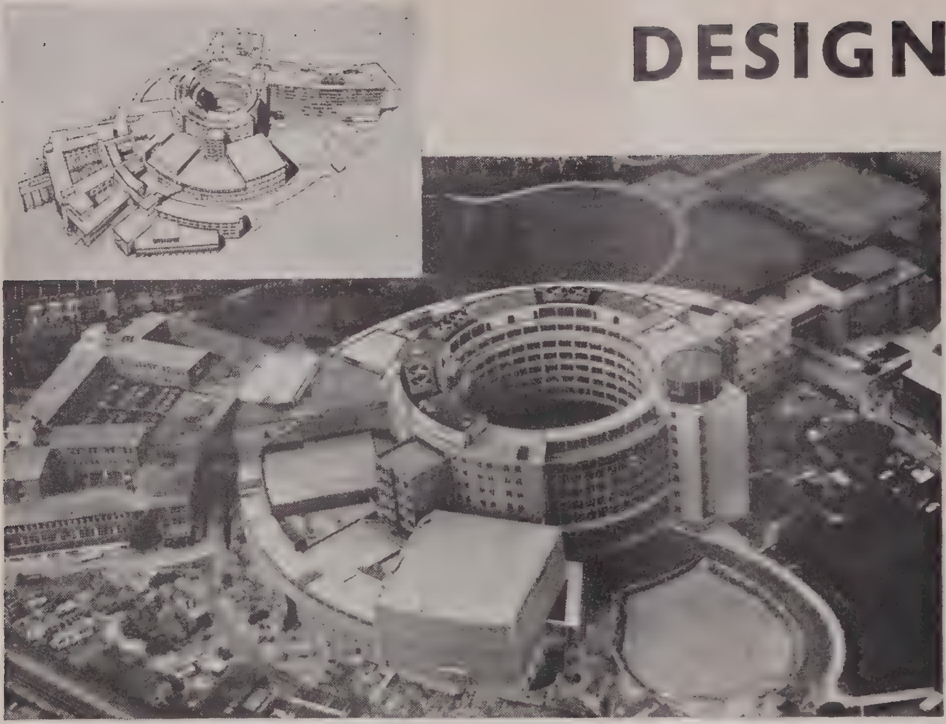
THE report of the Council of the Association of Consulting Engineers for the year ended 30th April last has just been published. It shows that work abroad has continued at a high level but, despite the improved financial situation at home, consulting engineers have not been employed in this country as much as had been hoped. This may be due to difficulties encountered by the nationalised industries and local authorities over making the necessary financial provision. The Council points out that individual firms cannot obtain the necessary experience to undertake large overseas contracts unless they are employed on the type of works which the nationalised industries have to carry out at home. Foreign clients will not be ready to employ consultants for specific jobs unless the consultants can show that they have had considerable experience in that type of work.

The British Transport Commission has employed some firms on individual works, but there has been no general application from the Commission for assistance from the Association in connection with the modernisation programme, although discussions took place some three years ago. The National Coal Board has also employed a few of the members of the Association on small works, but at the present time requests for even this type of work appear to have ceased.

The increased availability of conventional fuels has led to a slowing down of the programme for constructing nuclear power stations in the United Kingdom. It is, however, becoming increasingly clear that the Central Electricity Generating Board has no intention of giving any part of the reduced power programme to consultants within the foreseeable future. Nevertheless, work is proceeding in Scotland and Northern Ireland on other nuclear power projects and some specialised construction work is being carried out at establishments operated by the United Kingdom Atomic Energy Authority. The problem still facing many firms is that of keeping specialised staff, often with long, expensive training, actively occupied until an up-turn in the demand for advice on nuclear power projects begins.

DESIGNED FOR

COMPREHENSIVE FACILITIES AT NEW B.B.C. CENTRE



Aerial view of B.B.C. Television Centre and drawing of the building as it will be when completed

THE first programme will be transmitted from the B.B.C.'s new television centre at White City, London, on 29th June. The main circular block, containing seven studios, technical areas, dressing rooms and offices, covers an area of some three-and-a-half acres. It is now structurally complete and much of the equipment has been installed. A scenery block and restaurant block have also been finished and are in use. The ultimate æsthetic effect of the circular building must await the construction of a spur to contain more offices and operational areas. A services block is to be started next year.

Much skill and imagination have been shown in the utilisation of an awkwardly-shaped site, which covers approximately 13 acres, and in the arrangement of the various technical and other facilities within the building. The decision to adopt a circular building, with a circular well, has led to the elegant solution of many problems.

The studios are grouped around the central seven-storey ring, and on the outside of the studios (their floors are at ground level) there is a covered carriageway for the transport of scenery. One studio is now complete; the presentation suite will be ready shortly; another studio will be ready in the autumn; and two more and the second presentation suite by the summer of next year. The remaining three, already erected in shell form, will be equipped at a later stage. The largest studio has a floor area (10,800 sq ft) nearly twice that of any existing B.B.C. studio. The work carried out to date has cost some £10 million.

Care has been taken in the design to provide space for possible future developments, such as colour and a second programme, and this will enable additional electronic equipment, lighting and ventilation plant to be installed without any major building work. Space is also available on the site for additional studios.

As a result of past experience and a comprehensive series of experiments, many innovations are being adopted in the layout, equipment and operation of the studios. One aim has been to achieve a consistently high standard of picture quality with a smaller staff. The widespread use of remote control enables the majority of the apparatus to be located in special rooms, separate from the production and control areas, thus facilitating pre-setting and maintenance. It also makes it possible for the production and control staff to be brought closer together and thus work more effectively as a team. In each studio the vision, lighting and sound control rooms are arranged on each side of the production control room. Glass partitions between rooms enable key personnel to keep in close visual contact with each other, an important requirement, and they have a clear view of the studio floor through a continuous plate glass window in the studio wall. The apparatus rooms are behind.

An example of a departure from established practice is the provision of a vision control console (for the remote control of the camera control units in the apparatus room) alongside the lighting control console. It is based on the principle that the staff responsible for the setting and control of the lighting of the studio scene and for the control of the camera exposure and the resultant video signals should be close together and view the same picture monitors. At the same time it has been possible to arrange for one operator at the vision control console to control electrically all the cameras in a studio, which may be as many as six. This has been achieved, first by arranging the controls and picture monitors in such a way that the minimum of effort is required by the vision control supervisor and, secondly, by designing the cameras and their associated equipment for remote control. This necessitates a very high degree of electrical stability, but it has been proved that an image orthicon camera channel can be used in this way with only two operational controls —one varying the light input, by means of a remotely controlled iris, and the other the picture black level.

TELEVISION

The B.B.C. Television Centre is a remarkable building which contains many novel ideas in studio layout and equipment. It has been specifically designed for the requirements of television and will be capable of producing 1,500 hours of electronic programme material a year

The operational controls in the vision control console have been developed to enable three functions to be performed with a single knob. Moving the knob over a quadrant varies the lens aperture, rotating the knob adjusts the picture black level, and pressure on the knob will switch a single monitor from one camera to another. Each camera has, as usual, its own picture monitor and this last facility enables the pictures from each of the television cameras to be displayed in turn on a single preview monitor so that the pictures can be accurately matched, eliminating possible differences in individual monitors.

Alongside each picture monitor is a compact waveform monitor developed for operational checking of voltage levels. The waveform display is about 5in high and can be seen easily from a distance of 5ft, but the time scale is compressed to about 1¾in. This is of little importance, as the vision controller is mainly interested in setting correct voltage levels. To facilitate this, the monitor includes an " electronic cursor " which superimposes on the display a line corresponding to white level. This line, which is traced during the field suppression period, and black level, which appears during each line suppression period, gives the two limits of the signal excursion. To assist stability further a line-by-line clamp is included in the output stage of the monitor amplifier.

The lighting control desk provides very flexible control facilities, including twenty memory combinations to enable the lighting supervisor to do the majority of his lighting changes on transmission at the touch of a single control. The desk incorporates a mimic diagram showing the state of dim of every lighting control channel.

The inlay/caption equipment, consisting of two vidicon camera channels, slide projectors, a film strip projector, and electronic switch, can be controlled by a single operator at a desk in the production control room. The inlay process enables a " hole " of any desired shape or size to be made in a picture from one camera channel and to fit exactly into this hole another picture from an entirely separate source.

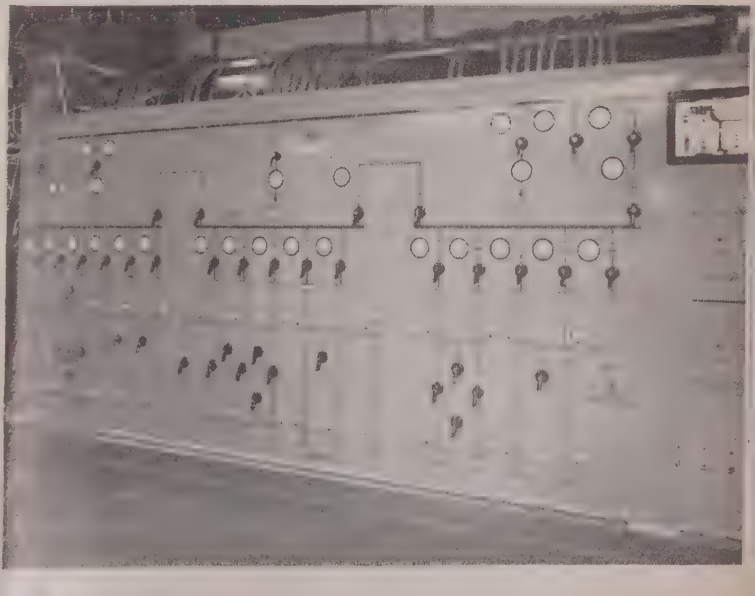
The central control room in the presentation suite is the focal point for the control of programme contributions from all sources. Here continuity of the national network programmes is maintained. Also included in the presentation suite is the international control room, which is intended to replace the present Continental control point in Broadcasting House.

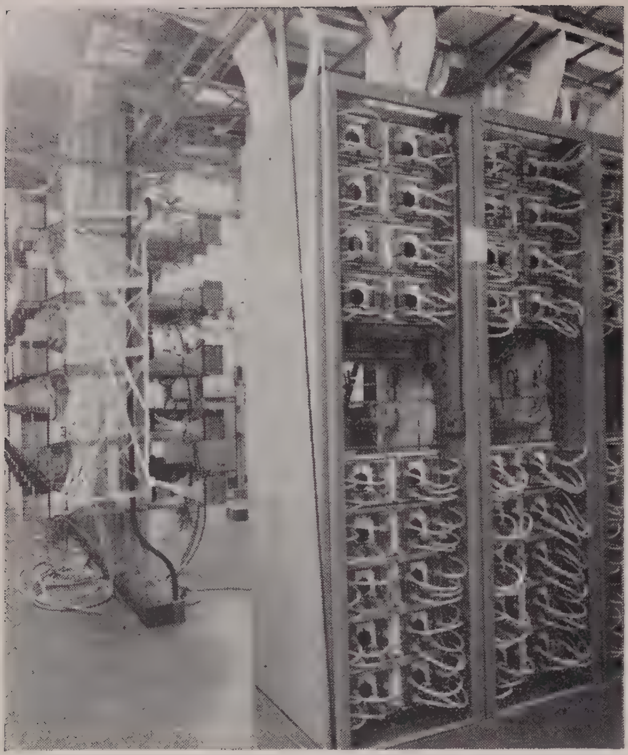
All the operations in the central apparatus room, which forms part of the presentation suite, are normally carried out from the main desk and the technical facilities provided are as follows:—Two measurement positions, each comprising a high-grade 14in picture monitor, line-strobe oscilloscope and programme meter with a comprehensive sound and vision monitoring system; control panels for the routing of all programme sources to internal and external destinations; a 200-line engineering manual exchange; light indication of the routing of all programme sources on a " push to indicate " system; and loudspeaker talk-back to key areas in the Centre and satellite studios.

The vision apparatus bays are of the open type and ventilation of the equipment is achieved by blowing cool air between the rows of bays and extracting it at ceiling level. It is calculated that some 50 kW of heat will need to be dissipated when the equipment is in full operation.

All the vision and sound switching equipment is installed in a separate selector room. The main reasons for this are the problems of noise and the necessity to maintain a dust-free atmosphere for the efficient operation of the equipment. For the switching of the television signals, which are distributed in their composite form, considerable use is made of special motorised switches. Conventional uniselector switches are slaved from these and switch programme sound and auxiliary circuits at the same time. High-grade coaxial cable is used for all the vision circuits at the Centre and has an improved impedance tolerance, 75 ohms ±2 per cent, compared with the coaxial cable previously used for television installations. In order to keep equalisation and timing problems to the

The main remote control panel for the power supply switchgear





The central apparatus room showing some of the motorised switches in the vision circuits and (left) the main line termination frame

minimum, all the coaxial circuits between the central apparatus room and studios, telecinė areas, etc., are run in a multi-core coaxial cable specially made for the B.B.C. This cable consists of 14 coaxials, all individually numbered, with the outer sheath of the cable colour coded for easy identification throughout the building.

Studio Lighting

The production lighting installation at the Television Centre follows, in the main, the general principles satisfactorily pioneered in the B.B.C.'s Riverside Studios. Electric hoists are used for the raising and lowering of lamps and a comprehensive dimmer system gives intensity control and switching of every studio light source from a centralised control desk. The principal innovation is the introduction of luminaires which can be panned, tilted and focused by means of a pole from the studio floor. The lighting hoists are designed to carry a load of 250 lb at 30ft/min on aluminium alloy tubing 8ft 8in in length. Each such tube has two self-coiling cables wrapped round the two supporting wire ropes, each cable carrying two 2 kW circuits. All dimmers are auto-transformers and remote control is by electromagnetic clutches. All the studio lighting circuits are wired back to the dimmer room where a large patch cord panel enables any circuit to be connected to any available dimmer channel.

Alternating current is used for the studio production lighting and each studio has a 240 V single-phase power supply. The lighting load in the larger studios is 200 kVA, and provision has been made for trebling this capacity by conversion to three-phase working, to meet possible lighting requirements for colour television.

For the handling and hoisting of scenery, each studio will be equipped with electric hoists designed to traverse on wheels a minimum of 10ft between the main scenery runway beams. Battery-driven trucks and trailers and fork lift trucks are used for the transport of scenery from the scenery block to the studios.

Power Supplies

The estimated maximum demand for the initial development is between 3·5 and 4 MW and due consideration has been given to achieving the maximum security of this supply. The normal supply is taken from the Electricity Board's substation in the scenery block via two 11 kV underground cables operated as a closed ring to supply three 11 kV substations situated around the periphery of the main studio block above the scenery runway. Balanced pilot feeder protection is being provided on all the 11 kV cables, and each cable is capable of carrying the full load of the site. An emergency supply, also at 11 kV, is available in the event of a fault causing simultaneous failure of both normal supplies.

Control of all the 11 kV switchgear is provided from a remote control board situated in the central apparatus room. A subsidiary remote control board is provided in Studio 3 apparatus room and alternative local control of switching is provided in each substation.

The 11 kV switchgear has a fault capacity of 250 MVA and is solenoid operated, oil filled with vertical isolation, and with compound-filled busbars. The 11 kV/415 V step-down transformers are dry type, Class H insulated, of 750 kVA rating, and anti-vibration mountings have been used to reduce possible structural vibration troubles owing to their installation at a relatively high level in the building. This situation was chosen for the transformers and associated h.v. switchgear to bring the transformers close to the main electrical load centres while still meeting fire prevention requirements.

Remote controlled, solenoid-operated air circuit-breakers with a fault capacity of 25 MVA are used to control the main outgoing circuits from the transformers. General sub-distribution from the substation is by means of cubicle type switch-fuseboards with rotary action switches and horizontal isolation features.

In addition to the normal a.c. production lighting, a 110 V d.c. supply for arc lighting in back-projection equipment is fed to each studio from germanium rectifiers of 55 kW output, located in the main substation areas. Separate 110 V d.c. germanium-rectifier-fed supplies have been provided for camera dolly motors and similar mobile motorised equipment, to avoid the possibility of the varying loads taken by the motors affecting the light intensity from the arcs. Emergency lighting is provided on a maintained system whereby a minimum of lighting essential for safety purposes is normally fed with a.c. but, in the event of a failure of supply, a change-over contactor connects a 240 V battery supply to the circuits concerned.

Electronic Telephone Exchanges

TO provide an opportunity for the interchange of information and experience of the construction and operation of fully electronic telephone exchanges of all kinds, both in the United Kingdom and overseas, a conference is to be held at the Institution of Electrical Engineers from 22nd to 24th November. Authors wishing to submit papers for consideration should send their manuscripts to the secretary of the Institution on or before 15th July.

Jubilee A.M.E.M.E. Convention

The Association of Mining Electrical and Mechanical Engineers, founded in 1909 as the Society of Mining Electrical Engineers, largely as a result of a leading article in the *Electrical Review*, is this year celebrating its golden jubilee. Last week the annual convention was held at Blackpool, when a full programme of addresses, lectures, technical papers, visits and social functions took place.

THE annual convention of the Association of Mining Electrical and Mechanical Engineers, which this year celebrates its golden jubilee, began with an informal reception at the Norbreck Hydro Hotel, Blackpool, on Monday evening, 13th June. On the following morning there was a Council meeting and visits were paid to a number of establishments, including the Warton Design Unit of English Electric Aviation, Ltd., and the Lighting and Electrical Services Department of Blackpool Corporation which is responsible for the town's illuminations. The ladies visited Browsholme Hall and the Symbol biscuit works.

Presidential Address

The annual general meeting was held in the afternoon. Appropriate in a jubilee year, the newly elected president, Mr. A. E. Crook, the chief engineer (production) of the National Coal Board, in his address discussed electrical and mechanical contributions towards efficiency and safety in the coal mining industry over the last half century. He said that in 1909, when the Association was formed, coal was being obtained from about 3,200 mines which had an average annual output per mine of 82,000 tons. The total output of coal was nearly 264 million tons, but of this only 5 per cent was mechanically cut and an even smaller percentage was mechanically conveyed. The number of mines at which electrical equipment was installed could not be readily ascertained, but it was certainly much less than the figure of 1,472 or 45 per cent of the 3,289 mines working in 1913 when proper records were started. In 1912, the aggregate horse-power of the electric motors installed was about 511,000, including 317,000 below ground, corresponding to only 0·4 h.p. per person. Illumination below ground in 1909 was inadequate, being provided mainly by about 677,000 oil flame safety lamps, naked lights, and only 2,155 electric safety lamps of the 2 V type which had been introduced a year or two earlier.

The advance had been spectacular in recent years in accordance with the remarkable progress made in electrical and mechanical engineering in industry generally. The total horse-power used at the coal face had increased to about 800,000 in 1959, which was equivalent to nearly 2·5 h.p. per man employed there. In the same period the use of compressed air for driving coal cutters had declined from about 60 to 10 per cent in favour of electricity. The total length of conveyors had doubled during the last ten years and it was now about 3,000 miles, or an average of some four miles a colliery, and at the end of June, 1959, there were 1,166 locomotives including 320 electric battery and 11 electric trolley units. There had been a remarkable increase in the use of electrically-driven winding engines, mainly of the conventional drum type, from about 11 in 1909 to about 800 in 1959 out of a total of some 1,400. Last year, the number of electric safety lamps was approximately 610,000.

The amount of coal burned at collieries for generating steam, compressed air and electricity had decreased from 18 million tons in 1909 to six million tons in 1959, although there had been an increase in the use of electricity from an estimated 800 million kWh in 1909 to 5,451 million kWh in 1959, when 18·25 per cent was generated at the collieries and 81·75 per cent purchased. The reduction during the last ten years was mainly the result of substituting electricity for compressed air, of electrifying compressors, fans and winders and of shutting down more than half the generating plant at collieries. Since 1912 the aggregate horse-power of electric motors installed had increased about nine-fold and the average rate of increase of 5 per cent per annum over the last ten years showed no signs of falling. The electrical horse-power per person employed in the industry had increased to 7·05 last year. The number of motors was about 156,000 and electricity was now in use at all National Coal Board mines.

Safeguards Against Electrical Hazards

Mr. Crook went on to speak about safety, and in connection with electrical equipment said that the most important of the defences against the ignition of flammable gas were flameproof apparatus, intrinsically safe apparatus, earth-leakage protection, interlocking, earth-continuity protection, superlative flexible cables and plugs, a very high standard of electrical practice, sufficient time to properly maintain the apparatus, and the employment of enough electrical engineers and electricians who were properly qualified both technically and practically, most of which conditions were needed to prevent other electrical hazards such as fire, shock and/or burns.

Although the electrical horse-power used at mines had increased, the number of persons killed and seriously injured by electrical accidents had not risen in proportion. In 1912, 14 persons were killed and 46 reportably injured but, in 1959 when the horse-power was 4,666,098, 11 persons were killed and 94 reported injured; this was the second highest number since 1948. Thus a nine-fold increase in electrical horse-power had resulted in less than twice the annual number of serious casualties. This total was even more remarkable when considered in relation to the nearly nineteen-fold increase in the number of electric motors.

In considering those casualties caused by accidents when winding persons in shafts or overwinding accidents, the number had fallen from 123 in 1909 to ten last year. This reduction had been obtained by the use of much better speed controllers, overwind preventers and brakes.

Thornton Lecture

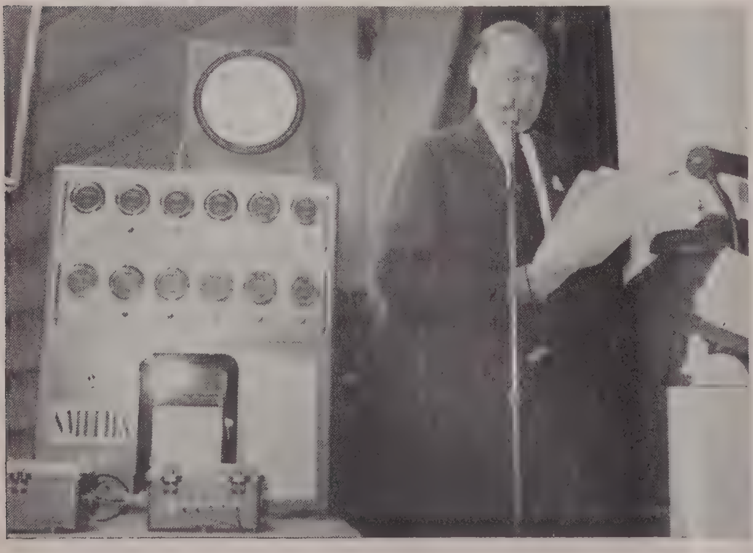
On the Wednesday morning, the twelfth in the series of W. M. Thornton Lectures was given by Mr. B. L. Metcalf, past-president of the Association and director of engineering, National Coal Board, who took as his subject " Technology and the Future." Technology, he said, was defined as the practice of any or all of the applied sciences that had commercial value, to which he added the rider " and can be applied with safety," since safety and commercial value or economics were closely related in the application of science to the mining industry.

In the application of the mechanical and electrical sciences to mining there was no limit to the variety of techniques, many of which were already in use covering the whole range from light-current electrical engineering involving modern techniques of communication to large and formidable machines. Technical progress did not always require the application of new scientific knowledge. The cheapest and quickest way was to use the knowledge which already existed and to improve machines step by step.

Mr. Metcalf began his survey by considering coal prospecting. Equipment lowered into a borehole could measure thermal conductivity, gamma radiation, temperature, earth potentials, resistivity, rate of penetration and borehole diameter. The characteristics of coal seams were low thermal conductivity, high resistivity, low self-potential, low radioactivity and high penetration rate. The most commonly used were electrical and seismic methods. The electrical methods measured resistivity, or the reflection of electrical waves from interfaces between strata of different electrical characteristics.

An interesting development was a form of geophone devised by the N.C.B. Scientific Department as an aid to the detection of men trapped underground. Signals produced by striking the strata concentrated a large proportion of the signal energy within the bandwidth 25 to 250 c/s, the lower frequencies suffering less attenuation. In the field trials, signals had been detected at ranges up to half a mile.

The Thornton Lecture was given this year by Mr. B. L. Metcalf



A nucleonic logging probe based on a gamma ray back-scattering technique had been devised to locate coal seams in a borehole. The probe carried a radioactive source and a detector. When it approached the interface of a coal seam and the adjacent stratum, the amount of radiation scattered back to the detector changed. It was possible to locate the seam boundary to an accuracy of approximately 3in.

In dealing with winding, he said that developments would concentrate more on the perfection of the mechanical brakes on the winder, their operation in conjunction with electrical braking and the elimination of lost time in brake application. For large winders the simplicity and reliability of the d.c. motor was bound to commend itself and this would lead to a more determined effort to perfect rectifier control to eliminate the motor-generator. A substitute for the mercury-arc rectifier was already available for small horse-powers and the range would no doubt be extended.

He went on to outline the various types of coal-face machines at present available and, in connection with the problem of handling the supply cable to a power loader travelling along the face, he spoke of a cable-handling device being developed by the Central Engineering Establishment of the N.C.B.

Roof Support System

A system of self-advancing roof supports devised by the N.C.B. Mining Research Establishment in which one operator, stationed at an electronic control unit, could advance a series of 256 chocks individually in any sequence, was demonstrated. The essential items of equipment added to the chock were an electro-hydraulic valve, a pressure transducer and a ram-extension transducer. The electro-hydraulic valve caused the props to be released and the chock moved forward in response to an electrical signal from the control unit; the transducers sent back signals which indicated when the chock was advanced to the required extent and the props were set against the roof. On receiving satisfactory indications from the chock, the automatic control circuits passed the advancing signal to the next chock. To reduce the total number of wires along the face, five were used for the control and monitoring signals and were connected to each chock through an individual transistorised relay mounted in a junction box on the conveyor. The remaining 20 wires were classified into three groups of eight, eight and four. Each chock was allocated an exclusive combination of three wires, one from each of these groups. The transistorised relay functioned as a coincidence gate and closed only when energised potentials were placed simultaneously on the three wires in the combination allocation to that chock; when the relay closed, full contact was established with the chock through the five signal wires.

A problem in attaining the completely manless coal face was to get the power-loading machine or plough to steer itself. A " coal-sensing " probe which was demonstrated had

The new president of the Association, Mr. A. E. Crook (second from right) with the authors of the two technical papers—on the left, Dr. Ing. E. h. E. Anderheggen and Ir. W. E. van Os and, on the right, Ir. M. B. J. Kneepkens

been devised by the N.C.B. Mining Research Establishment to guide power-loading machines. The probe used a measurement of the intensity of gamma rays scattered back from the floor of the coal seam to determine the thickness of coal left on the floor by the machine. It was hoped to try out this equipment at New Lount Colliery this year.

Transport was then discussed, Mr. Metcalf saying that at present locomotive units of about 25 tons weight were the heaviest that could be used. Given stable ground, a suitable locomotive for the proposed speed of 25 m.p.h. would be an electric pantograph unit with an overhead wire for power supply. A third-rail system, while technically possible, would cost far more than an overhead wire system. Modern transport systems required a simple and reliable form of colour-light signalling. Radio communication with moving trains was now a practical proposition and two different types of radio network were already in operation, at Herrington and Maltby Collieries.

Communication on both colliery and national bases was discussed, and Mr. Metcalf also commented on the eight-day flame methanometer developed by the M.R.E. In this instrument a flame was fed with a very accurately controlled flow of butane gas, ensuring a constant heat output which was measured by a ring of eight thermocouples. When the atmosphere contained methane, the heat output, hence the electrical output of the thermocouples, increased. For 1 per cent methane the increase of electrical output was about 20 per cent. The thermocouples gave sufficient output to operate a pen recorder directly, and initially it was intended that the instruments and a chart recorder should be placed at strategic points underground. A development would be to site the recorders on the surface and telemeter the thermocouple signals to this point. An intrinsically safe unit for converting the d.c. thermocouple output to a varying audio frequency had been developed.

German Mining Practice

Two papers concerning Continental mining engineering practices were presented on Wednesday afternoon. In the first, Dr. Ing. E. h. E. Anderheggen described the organisation of the engineering services at the Friedrich Heinrich Colliery, which is situated on the left bank of the Lower Rhine. The annual attainable output was three million tons of clean coal. All operations were supervised by specially trained engineers and deputies. Underground, the engineering service, like the mining and safety sections, was a separate works department and was divided into the mechanical and electrical services. At present, some 450 mechanics and electricians were employed underground out of a total staff of about 4,050 workers.

The turbo-generators had an installed power of 17 MW and supplies of 24 MW were available from other sources. Underground, 462 motors with an installed power of 11·4 MW and a peak load of 3 MW were in service. The surface equipment had 738 motors with an installed power of 7·8 MW and a peak load of 3·2 MW. The average installed power of all 1,200 motors was 16 kW and the average peak load 5·17 kW. Large consumers of electric power were the two four-rope winders at shaft No. 1 (3,000 kW each), the compressor (2,200 kW), the winders at shaft No. 3 (1,100 kW), and the mine fans at shafts Nos. 3 and 4 (together 1,800 kW). The coal-getting machines and face conveyors were operated electrically. Main road haulage was by 42 trolley-wire locomotives of 60 h.p. to 100 h.p. and eight diesel locomotives of 32 to 75 h.p.

Special attention had been given to the signalling and telecommunication network at the colliery. Underground alone there were 390 telephones and 41 radio-telephones in use, 36 of which were installed in the locomotives. In 1959, consumption of electric power underground had amounted to 15,515 million kWh, which was equivalent to 7·15 kWh per ton of clean coal for all underground machinery and 4·03 kWh for coal-getting machines.

The training of electricians for work on high-voltage equipment was carried out at the colliery and lasted 3½ years. After six months' basic instruction in metal working, the apprentice was employed for six months in the electrical shop on various work, such as rewinding of rotors and repairing of locomotive motors. In the next two years he was occupied with the installation of lighting and power, the erection of overhead lines and laying of buried cables in the various surface plant departments. The training was concluded by a period of four months in the electrical workshop underground, on repairs to the switchgear, on other repair work and attention to breakdowns.

Netherlands Maintenance Methods

The second paper, " Mechanical and Electrical Maintenance at the Netherlands State Mines," was given by Ir. W. E. van Os and Ir. M. B. J. Kneepkens. In dealing with the Emma Colliery, one of the two largest of the four State mines, producing about 9,000 tons of saleable coal a day, they said that maintenance of the electric power installations consisted largely of continual inspection to prevent the electrical equipment from being damaged by external causes. Maintenance work resulting from defects of the electrical equipment itself was small. Thirty-six men were engaged on the maintenance of the electric power installations at the coal face, while an additional maintenance staff of 16 men was required for the mechanised faces. Ten men were engaged on the maintenance, installation and dismantling of the telephone and signalling installations, two looking after the lighting installations at the face. Shifting of this lighting equipment was done by hewers from the face crew, who were specially trained for this purpose. The construction and periodical inspection of transformer rooms and cable roads was carried out by seven men. Electric power installation work was carried out by a special crew of 20 men from the pit section. Two men were also employed for the installing of the 6 kV network, which had become necessary because of the expansion of mechanisation and the existing 2 kV network was becoming inadequate.

Maintenance of electric motors was carried out to the following schedule: winding motors and convertors were checked every day, cleaned and blown out every three weeks, and overhauled every year. Overhaul included shield dismantling, correction of air gaps if necessary, bolt tightening and coil varnishing if necessary. Motors with journal bearings were inspected every month, the bearings being checked with the aid of a stethoscope. Some motors operated for five or six years and others only two years before overhaul was necessary.

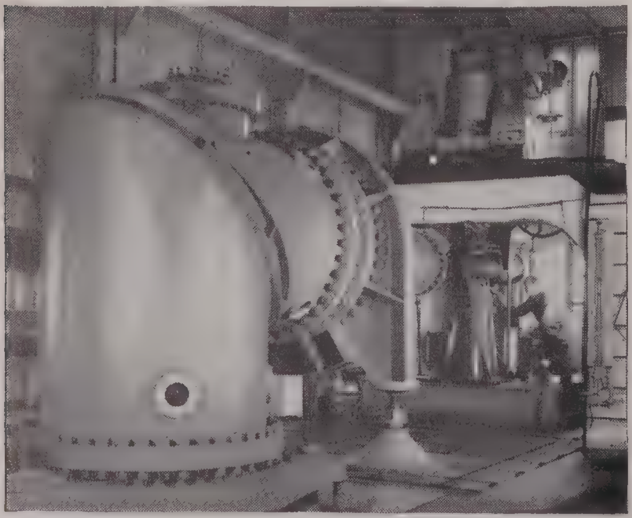
During Wednesday the ladies enjoyed a trip to New Brighton which included a cruise on the River Mersey, and in the evening the civic reception was held by invitation of the Mayor and Mayoress of Blackpool. The Thursday was devoted to visits to the Jodrell Bank experimental station of the Radio Astronomy Department of Manchester University and the works of Mirrlees, Bickerton & Day, Ltd., A. V. Roe & Co., Ltd., the Liverpool and Netherton factories of the English Electric Co., Ltd., the G.E.C. Osram Lamp Works and A.E.I., Ltd., at Trafford Park. The annual golf tournament was held during the day, and the ladies were able to visit Leighton and Levens Halls. An informal dinner and dance took place in the evening.

The chairman of the National Coal Board, Sir James Bowman, addressed delegates on the Friday morning. In discussing the present situation in the coal industry, he said that this year a market for eight million tons of small coal had been lost because of the construction or conversion of generating stations for oil burning. He felt that in due course these stations would " die out " and that in the future power stations would provide a major expanding outlet for coal. The " Revised Plan for Coal " forecast that by 1965 power stations would need 55 million tons of coal compared with 46 million tons last year, and he thought that these requirements would continue to increase.

The convention ended in the customary manner on the Friday evening with the president's reception and the Association's annual banquet and ball.

HYDRAULIC RESEARCH

THE annual report of the National Engineering Laboratory Steering Committee, " Mechanical Engineering Research 1959 " (H.M. Stationery Office, price 4s 6d), which was published last week, states that it has been decided to give priority to projects which are directed towards immediate industrial problems. The wide range of research reviewed in the report includes reference to the new facilities which became available for accurate measurement of the performance of reversible pump-turbine models under a wide range of operating conditions. Tests have been carried out on various pump-turbine models and prototypes of British designs. Results have indicated the outline of a design technique for good performance with both sets of operating conditions.



The closed-circuit water-turbine test ring which came into service a few months ago. Its maximum capacities are 250 h.p., 200ft head and 6,000 gal/min flow. The temperature, pressure and air constant of the flow can be controlled within close limits

Other important projects reviewed include investigations into machine tool control using moiré fringes, the development of hydrostatic power transmission and work on the cold extrusion of steel. The error signal obtained with the fringe technique applied to machine tool control can be fed into a servo system and correcting mechanism to reduce errors in relative movements continuously and automatically. In collaboration with David Brown Industries, Ltd., the Laboratory has applied such an error signal system to the final drive of a 30in gear hobbing machine.

Low-Temperature Investigations

RESEARCH into the behaviour of materials at very low temperatures are an important aspect of research being carried out at the Clarendon Laboratory, Oxford University, where Professor B. Bleaney, F.R.S., is Lee's Professor of Experimental Philosophy. In particular the variation in the magnetic properties of materials at nearly absolute zero is being investigated by Dr. N. Kurti, F.R.S., and to extend the work being done on this subject a new laboratory is to be built. Mullard, Ltd., have made a £25,000 grant towards the cost and the new establishment will be known as the Mullard Cryomagnetics Laboratory.

N.A.L.G.O. CONFERENCE

Pay and Working Conditions of Electricity Staffs

THE arbitration proceedings on the pay for general clerks in the electricity industry having been heard a few days before the annual conference of the National and Local Government Officers' Association opened at Brighton on 14th June, the claim naturally filled the stage at the meeting of electricity delegates. Mr. L. G. Moser, the organising officer for electricity staffs, expounded the basis of the claim: it was comparability with other similar employees and especially civil servants. The first arbitration proceedings had ended with a recommendation from the tribunal that the parties should try to compose their differences in the light of what was paid elsewhere and particularly in the civil service, but agreement had proved impossible. Broadly, the employers would have accepted the view that general clerks were comparable to clerical *assistants*, but not to clerical *officers*. The measure of the difference between the two sides was that the Boards offered a maximum of £620 as against the staff claim of £675.

Since in electricity, and in other fields, pay claims were already current, conference spent less time than usual on this subject; nevertheless, it reiterated two principles on which (in the absence of a rising cost of living) improved pay could be justified. They were, first, the doctrine of comparability with similar staff elsewhere; and, second, the right of non-manual workers to share in the benefits of higher productivity. The latter ground could also be cited in support of a shorter working week, and the conference recorded the view that 35 hours was a suitable length.

On the other hand, the delegates retained a sense of proportion and defeated a proposal for longer holidays for administrative and clerical staff and one which would have enabled staff who fell sick on a public holiday to have another day in lieu: the latter was rejected as "trivial."

On the day before N.A.L.G.O. conferences the delegates meet in separate groups according to their service and hear a report on the year's work; after this there are questions and debate, but no motions are considered since executive action is the prerogative of the full conference. Each year an attempt is made to endow the pre-conference meetings with wider powers and this year the Bournemouth electricity branch took the lead; it was not intended to deprive the conference of final decision, but only to enable the delegates in their specialist capacity to express an opinion on items of particular concern in their field. Nevertheless, this would duplicate debate, said the spokesman for the national executive council, and would weaken the sense of community in the Association. A speaker from the gas industry pointed out that the Association's service-conditions machinery was so constructed that the special interests of each service received the individual attention which it needed. This, said the speaker, was as far as they should go in specialisation.

The decision of the national executive council to vacate their headquarters at York Gate and to take a 21-year lease of new office buildings at Marylebone was criticised by delegates who preferred a policy of seeking a freehold headquarters, if possible purpose-built. The executive explained their prolonged but fruitless attempts to secure a site or building within reasonable reach of central London and the conference agreed that these efforts should be continued and a fund built up for the acquisition of a headquarters office.

Mr. G. T. Belton, deputy clerk of the Basford Rural District Council, was inducted as president.

Letter to the Editor

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

The Future All-Electric Home

IN your editorial of 3rd June you refer to Mr. T. E. Daniel's paper at the British Electrical Power Convention and his forecast that within ten years the total connected load for a typical three-bedroom house would be 95 kW. You say that Mr. Daniel might be accused of excessive optimism, but I wonder whether an annual return of £113 for a connected load of 95 kW would be regarded by the supply authority as so desirable.

My object in writing is to question whether these "optimistic" forecasts do the electrical industry more good than harm. A few months ago you reported a paper recommending the number of supply points in the various rooms of a typical house. My impression at the time was that the number was far in excess of the requirements of the most gadget-minded. Now we have Mr. Daniel's forecast, including a space heating load of 44 kW which is surely excessive, and a water heating load of 10·5 kW. I find a loading of 4 kW gives me all the hot water I require in my three-bedroom house. But what puzzles me is how the remaining load is made up. My 20-year-old cooker has a loading of 6,050 W which is probably low by present-day standards. Allowing 10 kW for the cooker, we are left with 30 kW for lighting, etc. How is this accounted for?

East Molesey, Surrey. J. EDMUND GAMAGE, A.M.I.E.E.

[Mr. Daniel included in his paper a four-page schedule of electrical applications in the all-electric home of the late 1960's. This gave full details of the equipment which he anticipated might be installed and these were summarised in the paper. In addition to the space heating and water heating mentioned by Mr. Gamage, cooking was shown as 15·5 kW and lighting as 3·68 kW, while thirty outlets, three clock points and eight spur boxes were expected to accommodate a further 36 kW of appliances of all descriptions.—Editors, *Electrical Review*.]

INDUSTRIAL NEWS

F.h.p. Motor Report

The first annual report of the Conference of Fractional Horsepower Motor Manufacturers, published last week, records the work of the Conference in the field of British and international standards, in arranging an exchange of information and statistics, and in providing its ten member-firms with a forum for the discussion of common problems. A technical committee has been engaged on the revision of specifications relating to fractional horsepower motors.

The Conference, which is an independent organisation serviced by the B.E.A.M.A., was established in March, 1959, to replace the former Association of Fractional Horsepower Motor Manufacturers, which was disbanded on account of the Restrictive Trade Practices Act. The annual turnover of this growing specialist industry is said to exceed £12 million.

The chairman of the Conference is Mr. C. A. J. Martin (Crompton Parkinson, Ltd.), the vice-chairman is Mr. E. G. Milner (Hoover, Ltd.), and the secretary is Mr. G. B. Wilkinson (B.E.A.M.A.), The Red House, Ascot, Berks.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 17th June is deemed to be 204s 6d. The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figures published on 17th June are 181·5 (1949=100) and 117·0 (1954=100); both figures are provisional. For turbo-generating and allied plant: Materials used in mechanical engineering industries 190·1 (1949=100) and 126·5 (1954=100); both figures are provisional. Blast furnaces and iron and steel melting and rolling (40 and 41) 188·6 (1949=100) and other steel goods, excluding tubes (311 and 312), 128·5 (1954=100); both figures are provisional. The price of ¾in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 17th June) is 49⅛d/lb.

Automatic Heat Treatment Line

A completely automatic heat treatment line for carburising, annealing, hardening and tempering has been installed by A.E.I.-Birlec, Ltd., at British Timken's Daventry East Works to treat tapered roller bearing cups and cones for vacuum-braked railway rolling stock. Once the components are loaded on to trays, their progress through the complete heat treatment cycle is fully automatic. The trays first pass simultaneously through a continuous gas-fired carburising furnace and after washing are transferred to an electrically heated pusher type furnace for sub-critical annealing. Rated at 145 kW, it is heated by wall-mounted tape elements arranged in three zones. This operation is followed by hardening in a roller hearth furnace with an 18ft long heating chamber electrically heated by nickel chromium alloy tape elements in the roof and by cast grids in the hearth. There are two heating zones in the furnace, with a total rating of 120 kW, and each component completes the hardening cycle in approximately an hour. The hearth rollers are arranged in a number of sections, each individually driven. The last section of rollers is fitted with an overdrive for fast discharge controlled by two photo-cell units. After further washing, the components are tempered in a continuous slat conveyor furnace rated at 48 kW. The components are automatically passed through the complete cycle by mechanical handling equipment and the operations are carried out in controlled atmospheres. It has been possible to minimise the formation of scale on components during heat to the extent that there is no necessity for any form of shot-blasting operation. By incorporating washing, rinsing and drying operations, degreasing of components has also been avoided.

The 120 kW roller hearth hardening furnace at British Timken's Daventry East Works

Isotope Information Bureau

An Isotope Information Bureau has been opened at the London Office of the United Kingdom Atomic Energy Authority in Charles II Street, S.W.1. Staff in attendance can provide visitors with a basic introduction to the industrial uses of radioisotopes, can specify reference works for study by those with further interests and place inquirers in touch with the appropriate departments of the Authority in those cases where detailed information is being sought.

Order for Locomotive Resistors

Fawcett Preston & Co., a company in the Metal Industries Group, has secured an order from the Brush Electrical Engineering Co., Ltd., for over 100 sets of locomotive resistors. They will be fitted to diesel-electric locomotives which the Brush Company is building for British Railways. Each set weighs about 6½ cwt. The order will be completed by October this year.

Dexion New Factory

The new factory of the Dexion Group on an eight acre site at Hemel Hempstead was officially opened on 14th June by Mr. J. Allason, M.P. for Hemel Hempstead. Production, which had previously been spread over three factories, is now concentrated at Hemel Hempstead where there is 150,000 sq ft of floor space. Five acres of the eight acre site have been developed and the company has the option on a further eight acres. The

The administration block of the Dexion Group at Hemel Hempstead

factory produces Dexion slotted angle, open steel plank, shelves and accessories for home and overseas, and employs 300 workers. Also housed at Hemel Hempstead are the group's Plastics and Timber Divisions which produce "Undulite," glass-fibre reinforced plastic sheeting, and "Tecton," engineered wood beams. There is also a large research and development department.

Switchgear Exhibition

Its newest unit, the 3·3 kV, 150 MVA (A.S.T.A. certified) type "AH" air circuit-breaker, was among the equipment shown by Whipp & Bourne, Ltd., at a private exhibition held in the Royal Station Hotel, Newcastle-upon-Tyne, on 2nd June. The purpose of the exhibition was to introduce this new h.v. air circuit-breaker unit, rated at 1,200 A, and to show its capabilities and suitability for heavy industrial applications, in particular the steel industry. Aditionally shown were the "IF" 900 A air circuit-breaker unit and the newer 2,000 A type "IFA" circuit-breaker.

Uskmouth Contract

The Darlington Insulation Co., Ltd., a member of the Darlington group of companies, has been awarded a contract to insulate the three 860 klb/hr Babcock & Wilcox boilers at the new "B" power station at Uskmouth, Mon.

New A.E.I. Journal

The first issue of an interim edition of a new journal—*A.E.I. Engineering Review*—has recently been published. Dealing with all A.E.I. products and with the technical work and research of the company as a whole, it replaces *B.T.H. Activities*, *M-V Gazette*, *Siemens Edison Swan Journal* and Henley's *Distribution of Electricity*. The interim edition will be made up largely of material prepared for these papers and will appear every two months until the end of the year. The first issue of the journal in its final format will come out in January, 1961, and thereafter it will be published monthly. In the first interim edition there are articles on large machine design using digital computers to reduce calculation time and achieve more realistic results, a new three-electrode gas-filled telecommunications line protector, inspecting and testing materials for turbines and generators, and stator/rotor units for use in hermetically sealed refrigeration compressors.

Transformers for Scottish Board

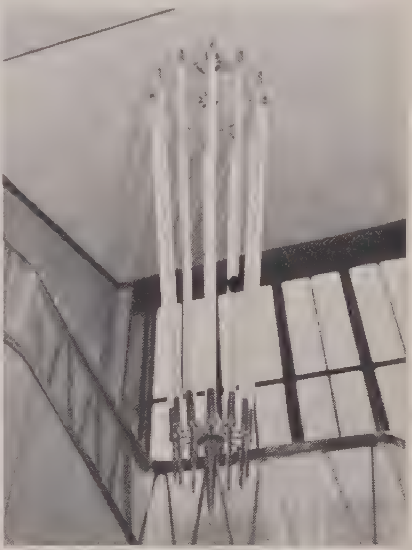
Bruce Peebles & Co., Ltd., are to build eight 275 kV transformers with an aggregate capacity of nearly 1,600 MVA. Six of the eight, four 240 MVA 275/132 kV auto-transformers and two 225 MVA 16/285 kV generator transformers, have been ordered by the South of Scotland Electricity Board for the new Scottish supergrid. The auto-transformers will be installed at Windyhill and Neilston transmission substations and the generator transformers, the largest double-wound units yet ordered for service in Scotland, will be installed at Kincardine "B" power station. The remaining units are two 90 MVA 275/33 kV transformers for the Ravenscraig substation of the South of Scotland Electricity Board. They will provide the supply for the new steel strip mill of Colvilles, Ltd.

Communications Circuit for Caribbean

An inter-island and aeronautical telecommunications system was officially inaugurated in Barbados on 10th June when the first call was made to Trinidad by the Federal Minister of Communications, the Hon. Andrew Rose. This £500,000 multi-channel v.h.f. scheme was engineered in conjunction with and on behalf of International Aeradio, Ltd., by Pye Telecommunications, Ltd., and Ericsson Telephones, Ltd. It provides modern automatic telephone and teleprinter services for islands operating in the Caribbean.

Novel Chandelier

A lighting fitting, the first of its kind, has been installed in the office entrance of Chance Brothers, Ltd. The new fitting uses opaque tubes of fire-polished glass alongside the normal fluorescent tubes to produce an effect of shimmering movement as the light is reflected in them. Of the twelve 8ft tubes used in this fluorescent electrolier only four are lit. They are of the "Atlas" type of 125 W and are arranged in symmetrical design with the decorative tubes.



Fluorescent chandelier installed in the office entrance of Chance Brothers, Ltd.

When the unit is lit the other tubes reflect the light, producing a shimmering effect. The fitting, which is made of brass, finished in silver plate, and stove enamelled with polished copper on brass relief, was manufactured by F. & C. Osler, Ltd., of Birmingham.

"Design for Living"

Under this title J. A. Crabtree & Co., Ltd., have produced a booklet with excellent pictures in colour setting out the requirements (room by room) for a complete domestic electrical installation and introducing the appropriate Crabtree accessories. A folder is enclosed, to be addressed to the reader's electrical contractor, in which the requirements can be specified in detail.

Instrument Publications

Two technical publications have recently been issued by Everett Edgcumbe & Co., Ltd., Colindale Works, Colindeep Lane, Hendon, London, N.W.9. The whole range of recording instruments made by the company are now noted in a 20-page brochure (No. 301), instead of separate leaflets, with all the technical data summarised for comparison. The second pamphlet, sheet 496/1, describes the new "Metrans" transistorised telemetering system relating at present only to electrical and pressure measurements; it is being extended to cover temperature, liquid levels, etc. The transmitted information can be sent over short or long distances subject only to a maximum value of resistance in the external circuit of 10,000 Ω.

Redundancy at Hoover Factories

Hoover, Ltd., announced last week that owing to falling demand on the home market caused by the recent imposition of hire-purchase credit restrictions, it would be necessary to make redundant a total of some 800 workpeople spread over the company's factory groups at Perivale (Middlesex), Merthyr Tydfil (Glamorgan) and Cambuslang. The total number employed in these factories was 8,610. All redundant employees would receive redundancy pay according to domestic agreements based on length of service.

To prevent the immediate dismissal of 300 workers, who had been declared redundant, the management of the company's factory at Cambuslang, Lanarkshire, agreed on 17th June to introduce a shorter working week for a limited period. At the end of this time, if the situation is substantially the same, a reduction of production employees will be put into effect. Agreement has also been reached at the Merthyr Tydfil factory, where a four-day week is to be worked. At Perivale, however, 2,000 employees on strike over the redundancies rejected by a majority vote on Monday an offer by the company that it would "consider adjourned" the works committee meeting of 14th June when the state of redundancy was declared.

Effect on Other Companies

Mr. C. E. Richards, joint managing director of Morphy-Richards, Ltd., in a statement last week, said that so far as they could see there could be no question of labour redundancy in Morphy-Richards, since the demand for the group's range of products remained buoyant.

A.E.I.-Hotpoint, Ltd., stated that in spite of the disruption caused by hire-purchase restrictions, there was no redundancy at its factories. Mr. R. Craig Wood (managing director) said in London last week that the demand for its new "Supermatic" washing machine and for the "Iced Diamond" refrigerators was still ahead of supply. It is stated that at the Llandudno factory there are several hundred new jobs to be filled before the end of the year. Like its competitors, Hotpoint has experienced a drop in demand for some products. For this reason it has suspended recruitment at the Peterborough factory and has transferred a number of workers to the lines which are in strong demand. In this way redundancy is being avoided.

Revision of Ex-Gratia Pensions

The Electricity Council, after consultation with the Electricity Boards, has agreed that ex-gratia pensions which were calculated and frozen at 31st March, 1948, shall attract all the pension increases since that date and any future increases that may be granted. The increases are subject to the over-riding provision that the amount payable shall not exceed the total pension payable under either of the main pension schemes, if all service had been calculated in full. The ex-gratia pensions are those carried over from pre-vesting undertakings.

Price Reduction

Morphy-Richards, Ltd., have reduced the price of their "Astral" spin dryer from £27 13s 7d to 22 gns.

Trunk Dialling

The first subscriber trunk dialling telephone exchange to come into operation in Scotland, and the first equipment of this type to be installed for the British Post Office by the A.E.I. Telecommunications Division, was opened on 14th June at Dundee.

Conference at Bankside House

The first biennial conference of the Hydro-Electric Power Commission of Ontario, the Tennessee Valley Authority and the Central Electricity Generating Board opened on Monday at Bankside House, London. The primary object of the meetings is to provide an opportunity for discussion of the managerial, technical, financial and administrative features of this type of publicly owned supply undertaking. The group from Canada is led by Mr. W. R. Strike, Q.C., vice-chairman of the Commission, and the group from the U.S.A. by Mr. Brookes Hayes, one of the directors of the T.V.A. The conference will last until 29th June.

Welding Exhibition

Murex Welding Processes, Ltd., is holding a special welding exhibition at the Rutherford College of Technology, Northumberland Road, Newcastle-upon-Tyne, 1, from 5th to 9th July. This exhibition is one of a series being held in various centres to demonstrate the new Murex automatic welding equipments and the latest Murex hand welding electrodes and equipments. A comprehensive range of Ross positioning and holding equipment is also being shown.

Change of Name

Edmundsons Construction Co., Ltd., has changed its name to K. S. Construction Co., Ltd. The policy and management of the company remain unchanged and the business will continue to be carried on from the head office, at 24-30, Gillingham Street, London, S.W.1, and the branch office at 2, Hartley Hill, Leeds.

Shorter Hours in Scotland

The Labour Committee of the Electrical Contractors' Association of Scotland and the Electrical Trades Union have reached agreement to reduce the normal weekly working hours from 44 to 42, to be effective in the working week following Sunday, 31st July.

Trade Announcements

After 200 years in Carnaby Street, London, W.1, **Edwin Crook & Co., Ltd.,** have removed to adjacent premises at 23, Beak Street, W.1.

The sales, market development and administrative offices of **Venesta Foils, Ltd.,** are being moved on 11th July to Thorn House, Upper St. Martin's Lane, London, W.C.2 (telephone: Temple Bar 6655).

Mr. J. M. H. Boutwood has joined the South East Region of **Philips Electrical, Ltd.,** as a representative for car radio and dictation machines.

John Westwood, Ltd., have moved to 88-94, Tottenham Court Road, London, W.1 (telephone: Museum 9851).

The **Telegraph Condenser Co., Ltd.,** and the **Sprague Electric Co.,** of the U.S.A., announce that they have come to an arrangement whereby the Telegraph Condenser Co. acquires the right to all Sprague United Kingdom patents and applications, together with the technical and engineering information necessary to exploit them, and Sprague will make available to T.C.C. all its present research and technical information and engineering knowledge and for the next 21 years the two companies will exchange research, development and manufacturing knowledge, extending beyond the field of capacitors and embracing all the products of the two companies.

C. E. Sleeper, Ltd., have moved to larger factory premises at Ponsford Works, Minehead, Somerset (telephone: Minehead 873).

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. R. J. Clayton

In the list of electrical men who received recognition in the Birthday Honours, given in our last issue, we mentioned **Mr. R. J. Clayton,** M.A., F.Inst.P., A.M.I.E.E., manager of the Applied Electronics Laboratories of the General Electric Co., Ltd., who has been awarded the O.B.E. We have since received his portrait which we now reproduce.

Mr. K. A. Lowe, B.Sc.(Eng.), A.C.G.I., A.M.I.Mech.E., and **Mr. R. D. Harvey,** A.M.I.Mech.E., recently left London Airport for Tokyo to take up their appointments in Japan. Mr. Lowe is chief resident engineer for the construction of the 150 MW nuclear generating station at Tokai-Mura and Mr. Harvey is the deputy chief engineer (electrical and mechanical) of the British General Electric Co. of Japan, Ltd. It will be recalled that the British General Electric Co. of Japan, Ltd., is building the Tokai-Mura station for the Japan Atomic Power Co. and is also acting as the link between the G.E.C./Simon-Carves Atomic Energy Group in this country and the main sub-contractor in Japan, the Fuji Electric Manufacturing Co., Ltd.

Mr. T. H. Kelsey, assistant general manager of the Witton Engineering Works of the General Electric Co., Ltd., has been appointed deputy general manager to Mr. J. J. Gracie, director of the company and general manager of the Witton Engineering Works.

Mr. D. G. Hawkins, A.M.I.E.E., has been appointed to be responsible for the computing services of the Central Electricity Generating Board. This appointment follows a decision by the full-time members of the Board to introduce centralised control over their computer services for all departments so that work done on all computers can be effectively reviewed and that decisions can be made on the allocation of work to the machine best suited for it. The responsible officer will be charged with extending the application of equipment so that it can be progressively used to greater capacity. He will be directly responsible to Mr. L. Rotherham, the Board member for research and development. Mr. Hawkins will be at Bankside House, Sumner Street, London, S.E.1.

Mr. C. R. Waterhouse

Mr. C. R. Waterhouse, J.P., the new president of the Electrical Contractors' Association, was born in 1902. In 1916 he became apprenticed to W. E. Burnand & Co. and remained with the company until 1925, being trained in the manufacture of motors, transformers and switchgear. He then started up his own business as an electrical contractor and retailer and is now managing director of C. R. Waterhouse, Ltd., Sheffield.

Mr. Waterhouse joined the E.C.A. in 1937 and was subsequently hon. secretary of the Sheffield Branch, vice-chairman and, in 1959-60, chairman. He has served on the Northern Counties Sectional Board since 1945 (having been chairman for two periods) and he has been a member of the E.C.A. Council since 1951 and of the Executive Committee since 1956. He was elected a vice-president in 1958. He has been a J.P. for the City of Sheffield for six years and hon. secretary of the Sheffield, Rotherham and District Discharged Prisoners Aid Society for ten years.

Mr. J. C. Nutter and **Mr. R. Y. Parry** have joined the board of Isotope Developments, Ltd., a member of the Elliott-Automation Group. Mr. Nutter is a director of Elliott Nucleonics, Ltd., another company in the group, and Mr. Parry, who has been with Isotope Developments for a number of years, is the manager of the company's works near Aldermaston.

Mr. H. V. Billing, A.I.E.E., has been appointed manager of the Essex Suburban District of the London Electricity Board in succession to **Mr. J. R. Kinnersley,** who was recently appointed management officer of the Board's South Western Districts. Mr. Billing started his career in the electricity supply industry in 1927 with the Westminster Electricity Supply Corporation, Ltd. In 1938 he joined Central London Electricity, Ltd., and after vesting day served in the Western Sub-Area of the Board. Since 1957 he has been district engineer of the West Bourne District. His appointment as district manager will date from 1st July.

W. T. Glover & Co., Ltd., announce the following appointments:—**Mr. W. R. Gibb** (financial director) and **Mr. E. P. G. Thornton** (technical manager—power cables) have been appointed joint assistant general managers. Mr. Thornton has also been elected a director of the company. **Mr. J. V. W. Richards,** who was formerly general production manager, becomes works manager, and **Mr. D. H. Booth,** who is appointed technical manager—power cables, was previously chief cable design and development engineer.

Mr. W. C. Spooner, of the Electrical Development Association, has retired after serving the Association as administrative assistant for thirty-five years. At an informal ceremony which took place recently at the

Mr. W. C. Spooner (left) receiving an electric cooker from Mr. J. I. Bernard (director and secretary) on his retirement

Association's offices, the staff said farewell to him and wished him well in his retirement. Before presenting Mr. Spooner with a Belling electric cooker, which had been subscribed for by his colleagues, Mr. J. I. Bernard, director and secretary, paid tribute to Mr. Spooner's work over the years.

Mr. O. M. Mansager

Mr. O. M. Mansager has been appointed deputy chairman of Hoover, Ltd. In making the announcement, Mr. H. W. Hoover, Junr. (chairman), says that the appointment will provide closer liaison between Hoover, Ltd., and the American company. It does not affect the day to day operations of Hoover, Ltd., which will continue under the direction of Mr. S. Roberts as managing director.

Mr. Mansager is a director and executive vice-president of the United States parent company and has been a director of the United Kingdom company since 1954. He is also a director of the Hoover Co., Ltd., Canada; Hoover Incorporated; Hoover (America Latina) S.A., in South America; and the Hoover Electronics Co., U.S.A. He joined Hoover in 1922 in the Sales Department. After subsequent promotions he became vice-president, sales, in 1952. He joined the board of directors in 1953.

Mr. M. K. Gomme, formerly divisional manager of the South Eastern Division of Electrolux, Ltd., has been appointed to the general sales manager's staff at the company's head office, 153-155, Regent Street, London, W.1. Succeeding him as divisional manager is his former deputy manager, **Mr. A. Preston.**

Mr. Gomme joined Electrolux, Ltd., in 1948 as a contracts representative in the Midlands, and was later appointed contracts manager at head office. In 1954 he was appointed deputy manager of the company's former South London Division, and in 1955 he became manager of the South Eastern Division on its formation.

Mr. Preston joined the company in 1950 as a sales representative in London and was later promoted as an area manager. He was appointed deputy manager of the company's South Eastern Division in 1956.

The new deputy manager of the South Eastern Division is **Mr. G. W. Anderson,** formerly assistant to Mr. F. L. Woodcock, manager of the company's London Division. Mr. Anderson joined the company in 1954 as a sales representative and was promoted as an area manager later that year. His successor is **Mr. E. A. Harding,** formerly an area manager with the company's Western Division, Bristol.

Mr. W. Buck, formerly an area manager in the Liverpool and North Wales Division, has been appointed assistant to the manager of the company's Yorkshire and North Lincolnshire Division, Harrogate.

The Central Electricity Generating Board has appointed **Mr. Philip Paul** as publicity officer in its Public Relations Branch. Mr. Paul was assistant press officer to Edmundsons Electricity Corporation from 1946 until nationalisation of the electricity supply industry in 1948, since when he has been an assistant in the Public Relations Branch of the British Electricity Authority and its successors, with special responsibilities for advertising and exhibitions.

Mr. G. G. Kitchener

Mr. G. G. Kitchener, Associate I.E.E., has been appointed chairman of the Association of Supervising Electrical Engineers in succession to **Mr. C. G. Aldridge.** Mr. Kitchener is a technical director of F. H. Wheeler & Co., Ltd., electrical contractors. He served an indentured apprenticeship with the Cubitt Car Co., Aylesbury, and completed his training with Richard Hunt & Co. After a short time with the Air Ministry Works Directorate, and London contractors, he joined F. H. Wheeler & Co., Ltd., in 1932 as an electrician, becoming chargehand in 1934 and foreman in 1936. In 1939 he was appointed area engineer for London and the Home Counties, and during the war was responsible for electrical work on several R.A.F. and Fleet Air Arm stations. In 1945, as manager, he opened the West of England office for his company, returning to the London office in 1947 to take up the appointment of senior engineer. He was appointed chief engineer of the company in 1954 and became a technical director in 1956.

Mr. Kitchener has been a member of the A.S.E.E. since 1941 and was elected to the Executive Council in 1953. He is a founder member of the Council of Management of Electrical Engineers (A.S.E.E.) Exhibition, Ltd., and he represents the Association on the B.S.I. Committee for Mineral Cable Glands and Seals.

Mr. W. B. Poulter

In our last issue we reported the appointment of **Mr. W. B. Poulter** as a member of the Southern Electricity Board with effect from 1st August next. We have now received his portrait which we reproduce. Mr. Poulter will continue to serve as a full-time officer of the Board.

Mr. W. S. Cliffe, for twenty-three years manager of the machinery department (southern area) of Thos. W. Ward, Ltd., is retiring from that position at the end of this month. He began his career in the company's head office at Sheffield in 1913 and was for seven years responsible for the Midlands area before coming to the London office. He continues to serve in an advisory capacity until 31st December and is succeeded in his appointment by **Mr. C. R. Harkcom,** formerly general manager of Thos. W. Ward's Indian company in Bombay.

The Minister of Power has appointed **Mr. J. S. Brichieri-Colombi,** D.F.H., A.M.I.E.E., of Shalford, Braintree, to be a member of the Eastern Electricity Consultative Council. Mr. Brichieri-Colombi is chief engineer and manager of the Engineering Division of the Crittal Manufacturing Co., Ltd.

For his services in connection with the construction of the Aswan hydro-electric generating station, **Mr. C. A. Stephens,** a director and late overseas manager of A. Reyrolle & Co., Ltd.,

Mr. C. A. Stephens, a director of A. Reyrolle & Co., Ltd. (left), showing the decoration awarded him by President Nasser, to Mr. H. H. Mullens (chairman and managing director)

was awarded the Commander Order of the United Arab Republic by President Nasser, and he was recently presented with the decoration by the Chargé d'Affaires of the United Arab Republic in London.

Four new appointments in the Electrical Appliance Division of Charles Colston, Ltd., have been announced. **Mr. N. J. Morris** has been transferred from the Tallent/Minibrix Division to become contracts manager of the electrical divisions of the southern branch, and in the northern branch **Mr. L. G. Napper,** of Harrogate, Yorks., becomes district manager of the Merseyside and North Wales district. **Mr. K. E. Sharples** is to fill the new post of Electricity Board liaison manager for the north western district and **Mr. W. R. Hunter** has been appointed district manager for the North Scottish district.

Mr. G. H. Tilbrook

Following Mr. P. Sydney's recent appointment as manager of the Chilterns Sub-Area of the Eastern Electricity Board, **Mr. G. H. Tilbrook,** A.M.I.E.E., has been appointed to succeed him as manager of the Suffolk Sub-Area. Mr. Tilbrook has served the electricity supply industry in East Anglia since 1926 when he joined the East Anglian Electric Supply Co. as an indentured apprentice at Felixstowe. He was subsequently actively engaged as assistant to the engineer responsible for co-ordinating all engineering functions in the areas in the eastern counties served by the Bedfordshire, Cambridgeshire & Huntingdonshire Electric Co., Newmarket Electric Light Co., Wisbech Electric Light & Power Co., in addition to the East Anglian Electric Supply Co. He was appointed engineer, Suffolk Sub-Area, in 1956.

Mr. C. F. Walkland, secretary of the Yorkshire Division, Central Electricity Generating Board, is retiring at the end of this month after forty-seven years' service. He entered the electricity supply industry when he joined Sheffield Corporation Electric Supply Department in 1913. After service in the 1914-18 war he returned to Sheffield, going to Leeds in 1929 as chief clerk of the Mid-East England Area of the Central Electricity Board; he later became chief clerk of the combined Mid-East and North-East England areas, and held this position until 1948 when he was appointed divisional secretary of the Yorkshire Division.

Mr. W. J. Foster has been appointed a director of the Dubilier Condenser Co. (1925), Ltd.

The **Birmingham Electrical Golfing Society** held an evening competition at Streetly Golf Club on 10th June. The prizes were presented by Mr. P. King (president) to the winner, Mr. A. D. Holmes; Mr. H. Martin was the runner-up. Mr. W. Horrocks appealed to members to make a special effort to attend the E.I.B.A. golf competition and dinner to be held at Edgbaston Golf Club on 27th June.

OBITUARY

Mr. Robert Nelson, M.I.E.E., of Harpenden, whose death occurred on 16th June, was one of the first engineers on the staff of Messrs. Merz & McLellan, consulting engineers, and was responsible for the design of the Carville power station. In 1907 he became the first Electrical Inspector of Mines under Sir Richard Redmayne. Later he rejoined Messrs. Merz & McLellan and in 1927 became a partner in McLellan & Partners, retiring in 1939. He was chairman of the Galloway Water Power Company when it was nationalised in 1948.

Mr. F. P. Egerton.—The death occurred suddenly at Epsom, Surrey, on 17th June of Mr. Frank Pownell Egerton, C.B.E., M.I.E.E., who played a prominent part in the promotion of electricity supply in Malaya. He went to Malaya in 1926 as assistant electrical engineer in the former Government Department of Electricity and became Director of Electricity to the Government after the liberation of the country in 1946. When the Central Electricity Board was set up he was appointed the first general manager and deputy chairman. He returned to the United Kingdom on his retirement in 1953.

Sir Francis Brake.—The death occurred on 13th June, at the age of seventy, of Sir Francis Brake, chairman of Creed & Co., Ltd., vice-president and director of International Standard Electric Corporation, and a director of a number of other companies, including Standard Telecommunication Laboratories.

Mr. F. C. Archer.—The death has occurred at the age of sixty-two of Mr. F. C. Archer, superintendent of the Winding Department at the Witton Engineering Works of the General Electric Co., Ltd. Mr. Archer joined the G.E.C. in 1937 as assistant superintendent of the Winding Department and became superintendent in 1946. He introduced many new features in the winding and manufacture of electrical machines and played an important part in the application of direct-cooled windings for large alternator rotors and stators and, in the field of traction, acted jointly with the late Mr. G. H. Fletcher in producing the Fletcher-Archer armature coil.

Mr. H. de A. Donisthorpe.—We regret to record the death, which occurred suddenly on 15th June, of Mr. Horace St. John de Aula Donisthorpe.

The late Mr. H. de A. Donisthorpe

Mr. Donisthorpe, who was born in London in 1893 and educated at St. Paul's School and the City and Guilds College, was a radio operator in ships for Marconi's before the first world war and in 1914, under H. J. Round, he was engaged on the first work on thermionic valves. As a lieutenant in the Intelligence Corps he was one of three officers who introduced the valve to the B.E.F. in 1914. Later he was in charge of radio valve and d.f. work and training at Worcester, where he started broadcasting transmissions in 1917. In 1922 he was appointed assistant to the general manager of Marconi's and subsequently for a time represented the company in America. From 1926 until his retirement in May last year he was with the General Electric Co., Ltd., first as a special sales representative for "Osram" valves and later as deputy manager of the Valve and Electronics Department. Since his retirement he had been sales consultant to the Whiteley Electrical Radio Co., Ltd.

Mr. Donisthorpe was a past-president and past-chairman of the Radio Industries Club and for many years had taken an active part in the work of the Electrical Industries Benevolent Association, of which he was a member of the Council and chairman of the Finance Committee. He was the author of "Wireless at Home" and "Radio Call Book."

Mr. W. Clifford Jones, manager of the Cardiff branch of Brown Brothers, Ltd., died recently. Mr. Jones had been with the company for nearly forty years, twenty-five as branch manager.

Mr. George William Cole, A.M.I.E.E., formerly of Mumar, Travancore, died on 16th June in a Brighton nursing home.

GENERATION AND DEVELOPMENT

Fall in Domestic Appliance Sales

During April Area Boards' sales of all the major types of domestic appliances, except storage water heaters, were lower than in the corresponding month of 1959 although the latest hire and hire-purchase restrictions did not come into force until 29th April. Washing machine sales showed the sharpest decline (see table). The figures, issued by the Electricity Council, relate only to sales by Area Boards in England and Wales.

Type of Appliance	Month ended 30th April		Twelve months ended 30th April	
	Total	Change %	Total	Change %
Cookers ...	27,015	− 2·8	345,149	+ 16·8
Water Heaters:				
Immersion ...	16,743	− 5·6	193,546	+ 13·8
Storage ...	6,197	+ 20·3	65,669	+ 22·6
Wash Boilers ...	4,436	− 24·2	63,963	− 17·2
Washing Machines ...	11,068	− 28·8	157,511	+ 15·7
Refrigerators ...	15,657	− 0·6	172,449	+ 84·5

Economics of Heating

To secure factual data on the performance and economics of thermal storage block-heaters in comparison with other heating systems, eleven office premises equipped with fuel-fired central heating, direct acting electric heating or electric floor heating were investigated for one heating season. Block-heaters were then installed for the following season. Details of the investigation are discussed in the Utilisation Research Report No. 14 issued by the Electricity Council (Winsley Street, London, W.1).

The report concludes that electric thermal storage block-heaters are fully competitive with other forms of heating. The capital cost of such an installation appears to be about the same as a conventional hot water central heating. The electricity bill may, however, be higher than the fuel bill by up to 100 per cent, but consideration of labour costs for stoking, etc., and of the differential in the costs of repairs and maintenance lowers the total annual cost of the block-heater installation to the same level as that of solid fuel central heating. Little difference was found between block-heater and floor heating installations in respect to both performance and cost. For temperatures not below "average cold spell" level, a 25 per cent increase of the block-heater capacity over the corresponding calculated heat loss appeared to be sufficient with some installations. It is suggested that savings of consumption could be effected by improved methods of automatic control and by some means of manually controlling the heat output. Large-scale tests of methods of control are still in progress.

Rise in Output Continues

The Ministry of Power's monthly statement of electricity output shows that 8,781 million kWh was generated last month by the C.E.G.B. and the two Scottish Boards, an increase of 14·5 per cent over the correseponding month of 1959. As Whitsun fell in May last year but was later this year, the true rate of increase is somewhat less than this figure but fully maintains the recent level of expansion. Apart from the Boards' output, 609 million kWh was generated at nuclear power stations of the U.K. Atomic Energy Authority in the seventeen weeks ended 2nd May last; this compares with 287 million kWh in the same period of 1959.

The monthly statistics issued by the Electricity Council show that the sales of Area Boards in England and Wales increased by 15 per cent in May, but when corrected for weather conditions and the number of working days the effective increase was 13·2 per cent. The North of Scotland Hydro-Electric Board generated 159·2 million kWh, of which 24 million kWh was exported to the South of Scotland Electricity Board. In addition, the latter imported 24·9 million kWh from the C.E.G.B. and 88·4 million kWh from the Chapelcross station of the U.K. Atomic Energy Authority.

Representations to London Board

A number of matters relating to charges, policy, etc., are being raised with the London Electricity Board by the Metropolitan Borough Councils. Referring to the charge of 7s 6d for fuse replacement, the Councils point out that this is a hardship to old and infirm people. It is also felt that this payment should not in any event be required where the "unit" or other charge paid by a consumer includes

ELECTRICITY GENERATED AND SENT OUT FOR PUBLIC SUPPLY

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Output capacity MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total		
Central Electricity G.B.... ...	3,327	67	420·6	8,155	3	8,162	7,665	25,537
North of Scotland H.E.B. ...	—	—	1·2	—	154	159	159	1,043
South of Scotland E.B.	228	3	0·2	452	8	460	432	1,656
Total for May, 1960	3,555	70	422·0	8,607	165	8,781*	8,256	28,236
Corres. total for May, 1959 ...	3,289	92	312·2	7,509	152	7,670	7,204	26,271
Inc. or dec., per cent	+8·1	−24·0	+35·2	+14·6	+8·3	+14·5	+14·6	+7·5
Total to date (5 months), 1960...	21,652	437	2,261·6	50,371	1,250	51,688	48,701	
Total for corres. 5 months of 1959	20,174	511	1,685·5	44,844	946	45,850	43,188	
Inc. or dec., per cent	+7·3	−14·4	+34·2	+12·3	+32·2	+12·7	+12·8	

* The total figure includes generation by other methods amounting to 9 million kWh.

ELECTRICITY SENT OUT BY BOARDS FOR THEIR CONSUMERS

Board	Totals for May (million kWh)			Twelve Months Totals Ended 31st May (million kWh)		
	1959	1960	Inc. or Dec. %	1959	1960	Inc. or Dec. %
London	551·1	612·6	+11·2	7,852·9	8,406·7	+ 7·1
South Eastern	397·9	439·8	+10·5	5,350·2	5,869·6	+ 9·7
Southern	514·8	594·7	+15·5	6,900·3	7,736·2	+12·1
South Western	251·7	277·3	+10·2	3,279·4	3,619·3	+10·4
Eastern	637·8	729·3	+14·4	8,459·7	9,343·2	+10·4
East Midlands*	543·8	633·0	+16·4	7,046·4	7,799·7	+10·7
Midlands*	699·3	823·0	+17·7	9,165·3	10,299·3	+12·4
South Wales*	425·8	484·4	+13·8	5,157·6	5,712·9	+10·8
Merseyside and N. Wales* ...	433·8	492·4	+13·5	5,468·3	6,043·2	+10·5
Yorkshire*	683·3	812·1	+18·8	8,748·1	9,975·8	+14·0
North Eastern*	410·7	473·2	+15·2	5,165·5	5,732·6	+11·0
North Western*	686·3	812·6	+18·4	9,078·7	10,016·7	+10·3
Total all Area Boards	6,236·3	7,184·4	+15·2	81,672·4	90,555·2	+10·9
Direct Supplies by C.E.G.B. ...	275·0	305·9	+11·2	3,104·1	3,666·3	+18·1
Grand Total	6,511·3	7,490·3	+15·0	84,776·5	94,221·5	+11·1
Mainly Industrial Areas*	3,883·0	4,530·7	+16·7	49,829·9	55,580·2	+11·5
Mainly Non-Industrial Areas ...	2,353·3	2,653·7	+12·8	31,842·5	34,975·0	+ 9·8
South of Scotland E.B.	511·9	569·2	+11·2	6,833·6	7,485·2	+ 9·5
North of Scotland H.E.B. ...	113·0	121·7	+ 7·7	1,556·1	1,690·6	+ 8·6

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

an element of maintenance cost, or the Board is otherwise responsible for the installation.

Another question that the Councils are taking up with the Board is the condition of wiring installations in parts of the Board's area, particularly in the east and north-east London boroughs. The Councils contend that, as a public utility undertaking, the Board should accept responsibility for the renewal of these old installations and that consumers should not have to bear the considerable capital burden involved.

A clear statement of policy is called for on the re-positioning of prepayment meters fixed in inaccessible places. On tariffs, it is recommended that there should be a special rate applicable to electric floor warming systems operated during off-peak periods. It is also suggested that, in fixing tariffs and service charges, the Board should have in mind equity as between its own consumers and those of neighbouring Boards.

Members of district committees of the London Electricity Consultative Council should, it is considered, be given prior notice of any intention to introduce revised arrangements affecting their particular areas so that they may be aware of them at the initial stage and not as a result of complaints from consumers.

Improved Supply for Scilly Isles

Plans to improve power supplies at St. Mary's, Scilly Isles, were announced on 15th June when Mr. A. N. Irens, chairman of the South Western Electricity Board, visited the island, accompanied by Sir George Turner, a part-time member of the Board, and Mr. H. R. C. White, the West Cornwall district manager. Mr. Irens said that the Board would install another generating set at St. Mary's this year as part of a scheme costing £13,250 to reinforce the local system and increase the reliability of supply. Since the St. Mary's (Scilly) Electricity Supply Co. was taken over nearly three years ago, the Board had invested nearly £30,000 to improve the generating station and distribution network.

Western Avenue Underpass Lighting

A £10,000 contract has been awarded to the General Electric Co., Ltd., for lighting the Western Avenue underpass and adjacent roadways. When it is opened in the summer, the underpass will take the A40 beneath the North Circular Road.

Incorporating a unique system of graduated daylight to lessen the contrast between day and artificial light, the scheme is the first one for an underpass to be sponsored by the Ministry of Transport. Light-reducing canopies above the 220ft-long tunnel approaches will reduce the daylight while fluorescent lanterns will be more closely spaced as one nears the tunnel entrances. The tunnels themselves, 780ft in length, and pedestrian subways will also be illuminated with fluorescent lanterns. For the adjacent roads, colour corrected mercury lighting will be used.

The consulting engineers, acting for the Ministry of Transport, are Messrs. Rendel, Palmer & Tritton and the electrical contractors installing the lighting, Malcolm & Allan (London), Ltd.

Wiring Installation Improvements

Electrical installations in nearly 3,000 pre-war flats and houses owned by Wandsworth Borough Council are to be improved by the provision of power points in each living room, bedroom and kitchen at a total cost of £62,000.

OVERSEAS

Transmission Line Re-stringing

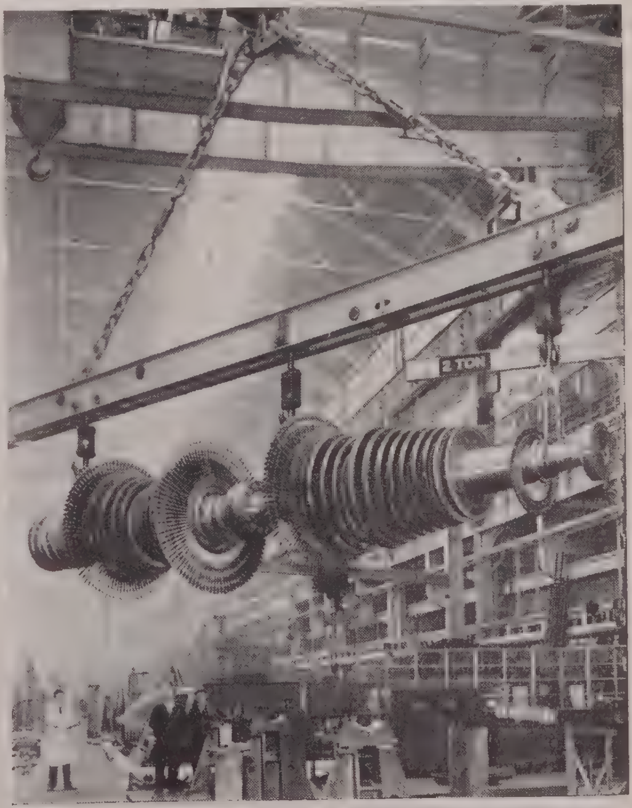
The Bowater Power Co., Ltd., has begun renewing the conductors of 128 circuit miles of transmission line at Deer Lake, Newfoundland. The work will be carried out over a period of two years and will cost about $1 million. Mr. M. G. Green, general manager of the company, said that there would be a saving of about 24 million kWh in an average year, and 31 million kWh if water conditions permitted full-load operation of the power plants. The company generates power at two hydro-electric stations: Deer Lake (156,000 h.p.) and Corner Brook (12,000 h.p.).

Swiss Railway Electrification Completed

The Geneva correspondent of *The Times* reports that the electrification of the 3,639-mile network of the Swiss Federal Railways, which was started in 1906 and delayed by the two world wars, was completed on 11th June with the opening of the electric service on the line linking Cadenazzo to Luino in the Ticino canton. At the same time the Italians inaugurated the newly electrified line from Luino to Arona and Novara, thus putting into service a second electrified line from Switzerland to the port of Genoa.

Cable for Kariba

The latest issue of the *BICC Bulletin* (No. 24—May) is devoted to the design, manufacture and installation of the 330 kV cable which the British Insulated Callender's Cables Group supplied for the Kariba hydro-electric scheme in Southern Rhodesia. The illustrations include an actual size cross-section of the cable as well as photographs of the manufacturing and installation processes and a sectional drawing of the power house showing the cable shaft and tunnel.



The photograph, taken at the Manchester Works of Associated Electrical Industries, Ltd., shows the steam turbine rotor for one of four 150 MW turbo-generator sets for the Burrard power station of the British Columbia Electric Co., Ltd. The turbines, which will run at 3,600 r.p.m., are of the three-cylinder, close-coupled reheat type, designed for initial steam conditions of 1,800 p.s.i., 1,000°F, with re-heat to 1,000°F

Financial Section

STOCKS and SHARES

STOCK EXCHANGE markets were left in a state of considerable indecision as a result of recent news. Whereas the main anxiety has been connected for some time with the possibility of additional credit restrictions, the report of the Hoover company's decision to reduce their labour force switched concern to the question of whether the new hire-purchase controls had not already made an effective impact upon some important branches of the consumer goods industries. Official over-all figures for retail trade were thought to have given little conclusive evidence so far on that point, but reports of slower trading in such "durable" goods as washing machines and refrigerators caused shares connected with these products to suffer most in a fairly general marking down of industrial share prices.

Market Reactions

With the possibility of a further increase in Bank Rate being freely debated, another serious relapse of gilt-edged securities helped to accentuate caution in the industrial market. In the sections concerned with domestic equipment, the news from Hoover left net falls of about 3s 6d in that company's ordinary shares, at 46s, and in the "A" shares at 41s, during the course of the week. It also induced a lowering of prices for such shares as Vactric to 27s 6d, Burco Dean to 11s 6d, Pressed Steel to 31s 6d, Radiation to 35s, Wilkins & Mitchell to 20s and Goblin to 8s. Shares of the big electrical groups were affected to the extent of declines of 2s in G.E.C., and of 3s 6d each in English Electric and A.E.I., while E.M.I. were 4s down on the week at 47s. In other sections, moderate declines were frequent, but good exceptions appeared in Chloride Electrical and Rheostatic.

Morphy-Richards

Morphy-Richards end their financial year this month and the final dividend declaration, together with the preliminary statement on the results, may be expected in October. Meanwhile the directors have issued a reassuring statement about the effect of the reimposition of hire-purchase restrictions so far as their firm is concerned. Demand is said to remain buoyant and they see no likelihood of labour redundancy. Nevertheless the price of the 4s shares was marked down by 1s 9d to 21s 9d during the week. On the basis of last year's dividend of 25 per cent (adjusted for a subsequent 100 per cent scrip issue) the yield is still under 2½ per cent. The interim payment on account of 1959–60 was, however, increased, while at the half-way stage turnover was reported to have expanded by about 25 per cent, and group earnings before tax by 39 per cent, as compared with the corresponding half of 1958–59. Increasing

Price Changes in

Company or Board	Nom. Value	Middle price 20th June	Week's Rise or Fall	Dividend Pre-vious	Dividend Last	Yield %	1960 High-est	1960 Low-est
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	75½	−½	3	3	3 19 6	79½	75½
Brit. Elec. 1974/77	100	71½	+½	3	3	4 4 0	76	71½
Brit. Elec. 1976/79	100	74	−1	3½	3½	4 14 6	79½	74
Brit. Elec. 1974/79	100	84½	−1	4¼	4¼	5 0 6	90½	84½
Brit. Elec. 1967/69	100	92	−½	4½	4½	4 17 9	97½	92
Overseas Electric Supply								
Calcutta Elec.	£1	21/–		6·8†	7†	10 17 3	20/9	19/3
East African Power	£1	16/6		7½	8	9 14 0	20/3	16/–
Nigerian Elec.	£1	16/6		8	8	9 14 0	19/9	15/6
Perak Hydro-Elec.	£1	18/6	−6d	10	5	5 8 0	19/–	15/3
Electrical Shares								
Aberdare Holdings	5/–	15/6		17½	17½	5 6 0	19/–	15/3
Aerialite	1/–	8/9		54	54	6 3 6	9/6	7/6
Allen, W. H.	£1	56/–		12	14	5 0 0	60/–	51/3
Allied Insulators	5/–	20/–		—	20	5 0 0	23/3	20/–
Anglo-Portuguese Tel.	£1	26/9	−1/6	9	9	6 14 6	29/–	26/–
Arcolectric	1/–	4/3		—	15	3 10 6	5/6	4/–
Aron Elec. Ord.	£1	77/–	+2/–	15	15	3 18 0	77/6	47/–
Assoc. Elec. Ord.	£1	54/9	−3/6	15	15	5 9 6	66/6	50/6
Automatic Tel. & El.	5/–	16/9	−1/–	17	17	5 1 6	21/9	16/9
Babcock & Wilcox	£1	37/6	−1/3	13	9	4 16 0	48/9	33/6
Bakelite	10/–	56/3		15	17½	3 2 3	56/3	40/–
Baldwin, H. J.	2/–	2/–		20	—	—	2/6	2/3
Berry's Electric	5/–	36/3	+9d	10	20‡*	2 15 3	38/–	29/6
Bowthorpe Holdings	2/–	8/3	−3d	27	18½*	4 9 9	11/6	8/–
British Elec. Traction:								
Def. Ord. "A"	5/–	45/–	−4/–	35	40	4 9 0	49/3	42/–
B.I. Callender's	£1	52/–	−3d	31½	13½	5 3 9	61/–	50/–
B.I. Callender's 6% Pref. ...	£1	20/–		6	6	6 0 0	21/–	19/9
British Thermostat	5/–	23/9		35	20*	4 4 3	26/–	21/3
Brook Motors	10/–	45/9	−6d	25	25*	4 12 6*	53/6	45/6
Bulgin, A. F.	1/–	9/6		50	55	3 17 0*	10/3	8/–
Bulpitts	5/–	17/6		15	16½	4 12 9	23/3	17/–
Burco Dean	5/–	11/6	−1/–	16	18	—	15/9	12/6
Cable & Wireless	5/–	16/–	−9d	10	10*‡	3 2 6	18/3	14/3
Chloride El. Storage "A" ...	£1	75/9	+3/3	20	17½*	4 12 6	75/9	65/6
Clarke Chapman	£1	48/9		13¾	13¾	5 12 9	63/6	48/9
Cole, E. K....	5/–	22/9	−3d	17½	20	4 8 0	31/9	22/–
Contactor Switchgear	5/–	16/3	−3d	14	14	4 6 3	17/9	15/9
Cossor, A. C.	5/–	7/–		Nil	5	3 11 6	10/–	7/–
Crabtree	10/–	24/–		20	22½‡	4 13 9*	28/3	24/–
Crompton Parkinson	5/–	13/3	−3d	12	14	4 4 6*	15/–	11/9
Davis & Timmins	5/–	23/–		20	25	4 7 0*	23/–	17/–
De La Rue	10/–	75/6	−1/6	20	22½	2 19 9	77/6	62/–
Decca "A"	10/–	46/3		50	20*	4 6 6	51/3	42/–
Desoutter	5/–	43/–		21⅝	30	3 9 9	42/–	37/6
Dewhurst	2/–	7/6		20	20	5 6 9	8/6	7/6
Dictograph Tel.	2/–	9/–	−3d	20	20	4 9 0	9/9	9/–
Dimplex	5/–	32/6	+6d	—	25‡	3 17 0	32/6	26/9
Dubilier Condenser	1/–	5/6		20	25	4 11 0	6/–	5/–
Duport	5/–	25/6		12½	17½	3 8 9	30/3	22/–
E.M.I.	10/–	47/–	−4/–	20	14*‡	2 19 6	58/9	45/–
Electrical Apparatus	5/–	16/–		14½	14½	4 11 0	16/–	12/9
Electrical Components	5/–	9/9		12½	15	5 2 6*	13/9	9/6
Elec. Construction	£1	36/3	+1/3	9	9	4 19 3	43/–	35/3
Elliott-Automation	5/–	26/–		—	9·3*	1 15 9	26/–	19/9
Enfield Rolling Mills	£1	54/6	+1/–	15	15	5 10 0	56/3	48/–
English Electric	£1	37/9	−3/6	14	10*	5 6 0	53/–	37/9
English Electric 3¾% Pref. ...	£1	12/–		3¾	3¾	6 5 0	13/–	12/–
Ericsson Tel.	5/–	22/6		13†	13†	4 14 3	28/6	22/6
Ever Ready	5/–	27/6		27½	20*	3 12 9	27/6	23/–
Falk Stadelmann	£1	31/6	−6d	10	10	6 7 0	35/9	31/6

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

benefits were expected from new additions to the group's range of appliances.

Ward & Goldstone Dividend

There was a firm reaction from Ward & Goldstone 5s shares to the preliminary statement of the results for the year ended in March. Shareholders are to receive an increase in the dividend for the tenth year in succession and the extent of the rise from 30 to 35 per cent was up to market expectations. The latter were satisfied also by the company's achievement of slightly better profits in last year's trading conditions, and were pleased by the 100 per cent scrip issue proposal. Cover for the higher dividend rate remains above average and the yield improves to nearly 3 per cent.

Electrical Investments

Company or Board	Nom. Value	Middle price 20th June	Week's Rise or Fall	Dividend		Yield %			1960	
				Previous	Last				Highest	Lowest
Electrical Shares—continued						£	s	d		
G.E.C.	£1	37/9	−2/−	10	10	5	6	0	47/6	37/−
G.E.C. 6½% Pref.	£1	20/6		6½	6½	6	6	9	22/3	20/6
General Cables	5/−	5/9		15	Nil	—			10/−	5/9
Goblin (B.V.C.)	5/−	8/−	−1/3	7½	12½	7	16	3	13/9	8/−
Hackbridge Holdings	5/−	15/9		20	20	6	7	0	17/3	15/−
Hackbridge & Hewittic	5/−	14/9		20	20	5	1	9*	15/−	13/−
Head Wrightson	5/−	22/6		20	14*	3	2	3	31/6	21/3
Heatrae	2/−	12/−		20	22½	3	15	0	12/3	8/9
Holophane	5/−	17/3	−9d	22½	26	7	10	9	20/6	17/3
Hoover	5/−	46/−	−3/6	60	90	4	17	9*	55/−	45/−
Intl. Combustion	5/−	28/3	−6d	30	30	5	6	3	46/9	26/6
Intl. Computers & T.	£1	66/3	−3/9	—	10	3	0	3	78/6	61/6
Johnson & Phillips	£1	21/3	−3d	5	Nil	—			24/−	19/6
Laurence Scott	5/−	20/−		15	15*	3	15	0	25/3	18/−
Lister, R. A.	£1	54/6	+6d	12½	14	5	2	9	62/−	52/6
Lucas, J.	£1	68/9	+1/3	10	12½	3	12	9	74/6	65/−
Marryat & Scott	2/−	15/−		37½	22½*	2	19	0	16/9	14/3
Mather & Platt	£1	47/6		10⅜	11	4	12	6	59/−	47/6
Metal Industries	£1	63/−	−1/−	14	15‡	4	15	3	76/3	61/3
Midland Elec. Mfg.	£1	58/9		10	12	4	2	0	58/9	53/6
Morphy-Richards	4/−	21/9	−1/9	20	25	2	6	0*	23/6	16/3
Murex	£1	68/9	−1/3	17½	15	4	7	3	77/−	62/6
Newman Ind.	2/−	5/−	−3d	10	12½	5	0	0	5/3	4/−
Oldham & Son	1/−	3/3		17½	17½	5	7	9	3/3	2/9
Parsons, C. A.	£1	53/9	−1/−	8⅓	9⅜	3	9	9	59/−	46/−
Philips' Lamps	Fl.10	230/−	+15/−	13·3	16	1	7	9	£11¾	137/−
Plessey	10/−	49/−		20	14*‡	2	17	3	54/6	44/3
Pye	5/−	16/−	−1/3	12½	12½*‡	3	18	3	19/−	16/−
Pyrotenax	5/−	55/−	−1/−	—	34	3	1	9	56/−	44/3
Radiation	£1	35/−	−2/6	6	12	6	17	3	44/6	34/6
Reliance Clifton	5/−	23/6	+6d	15	15	3	3	9	28/−	22/−
Reyrolle	£1	40/−	−2/−	17½	17½	4	7	6*	52/3	38/−
Rheostatic	4/−	17/−	+1/9	20	18¾*‡	4	8	3	17/−	12/6
Richardsons Westgarth	10/−	10/3		8⅓	8⅓	8	2	0	14/9	10/3
Sangamo Weston	10/−	21/−		12½	11*	5	4	9	22/9	19/3
Simon-Carves	5/−	46/3	−1/3	25	35	—			54/−	36/−
Smith (England), S.	4/−	18/−	−6d	12½	17⅓	3	17	9	20/−	16/−
Southern Areas	£1	15/−	+6d	Nil	5	6	13	3	15/6	13/−
Strand Elec.	5/−	16/3		15	20	6	3	0	20/3	15/9
Sturtevant	5/−	15/9		15†	15†	7	16	0	24/3	15/−
Sun Elec.	5/−	15/9		25	15*	4	15	3	16/3	15/−
Switchgear & Cowans	5/−	16/−		15	17½	5	9	6	18/9	16/−
T.C.C.	10/−	46/3		25	35	5	1	0*	48/3	37/3
Telephone Mfg.	5/−	5/9	−9d	10	5	4	7	0	7/3	5/−
Telephone Rentals	5/−	20/9		12½	15*	3	12	3	20/9	17/−
Thompson (John)	5/−	17/9	−6d	25	20	5	12	9	25/9	17/3
Thorn Elec.	5/−	51/6	−2/3	17½	20	1	18	9	55/6	44/3
Thorneycroft	£1	25/−		7½	6	4	16	0	31/−	23/−
Tube Investments	£1	78/9	−3/9	20	13‡	3	6	0	95/6	65/3
Vactric	5/−	27/6	−3/3	25	37½	6	16	3	43/9	27/6
Walsall Conduits	4/−	13/9	−6d	22½	15*	4	7	3	16/−	13/9
Ward & Goldstone	5/−	60/−	+6d	30	35	2	18	3	60/−	51/3
Watford	2/−	11/−		25	25	4	11	0	17/6	11/−
Westinghouse	£1	50/−		10	11	4	8	0	59/9	49/−
West, Allen	5/−	13/−		12½	12½*	4	16	3	17/−	12/6
Wilkins & Mitchell	5/−	20/−	−1/−	15	17*	4	5	0	25/9	19/9
Wolf Electric	5/−	13/−		10	12½	4	16	3	13/3	10/9

Simms Motor Capital

Like other companies concerned with the growing demands of the motor industry, Simms Motor and Electronics need to raise fresh capital to advance their development plans. Details of an issue are expected shortly. Last year's trading produced an emphatic recovery from the setback of the previous period. Net profits, despite a much increased tax charge, expanded by more than 80 per cent to nearly £490,000 and provided very easily for an improvement in the dividend from 12½ to 15 per cent. Quoted at 14s 6d, the 5s shares offer a yield of nearly 5¼ per cent on the new rate, which is covered 2½ times by earnings.

Ultra Electric Results

In bringing up the dividend for 1956–60 to a total of 25 per cent, Ultra Electric are fulfilling the forecast made at the time of the " rights " issue last April, when the company raised about a million to finance a continuing expansion of business and to reduce dependence on Bank loans. An improvement of fully 50 per cent in group profits, as compared with those of the previous year, accommodates with plenty to spare a 5 per cent rise in the distribution. The latter goes only to the old capital but when issuing the new shares the directors expected that in the normal course of events it would be possible to pay the same rate for 1960–61 on both old and new shares.

Company News

Results published by British Electric Traction, whose present-day interests include a major investment in Associated-Rediffusion, fulfilled every expectation barring that of another scrip issue. Despite the announcement of improvements of 26 per cent in profits, and of 5 per cent in the dividend to a total of 40 per cent, the 5s " A " shares were marked down by 4s to 45s, and are now showing a yield of about 4½ per cent. A fall of 1s 3d, to 36s 3d, in Electric Construction shares followed the preliminary report of lower earnings and an unchanged dividend. A similar announcement from Richardsons Westgarth left the shares little changed at 10s 3d, the extent of the decline in earnings being no larger than anticipated, although it appears to leave the distribution not quite covered by the disposable surplus.

REPORTS and DIVIDENDS

Simon-Carves, Ltd.—At the annual general meeting last week Mr. R. B. Potter, the chairman, referred to statements in the Press implying that the G.E.C./Simon-Carves Group would incur a loss of over £2 million on the Hunterston contract. "Speaking for this company only," he said, "there is no evidence that substantial losses will, in fact, be incurred, and if such had been the case I should most certainly have reported the facts to you. I would remind you that it has for the past few years been our policy to write off substantial sums each year, which have paid for the research and development expenses we have had to meet on nuclear power plant."

At the class meetings and extraordinary general meetings of Henry Simon (Holdings), Ltd., and Simon-Carves, Ltd., held on the same day, the various resolutions for the merger of the two companies were passed.

Senior Economisers, Ltd. — The annual meeting was held on 13th June, the Hon. D. D. E. Vivian (chairman) presiding. In his review of the year, which had been previously circulated, the chairman said that a large proportion of their traditional business had been the supply of economisers for power stations, involving long-term contracts. In view of present-day conditions, he considered that the reduction in consolidated trading profit of 9 per cent was satisfactory. The turnover of Senior Economisers during 1959 showed a reduction as compared with 1958. However, once again the results benefited from the final settlement of several long-term contracts. The number of contracts of this nature still to be completed was now considerably reduced. After dealing with the subsidiary and associated companies, the chairman referred to the present position and prospects. He said that the value of orders received by Senior Economisers during 1959 was slightly more than the total for 1958. The order book now covered them for just over twelve months' production. The first few months of 1960 were encouraging and satisfactory orders had been obtained.

Ward & Goldstone, Ltd., report a group trading profit for the year to 31st March last of £1,087,356, as compared with £1,041,223 for 1958-59. Taxation absorbs £419,658 and depreciation £163,865. The net balance is £495,457 (against £478,205). It is proposed to pay a final dividend of 25 per cent, making 35 per cent for the year (against 30 per cent), and to make a one-for-one scrip issue. In January, 1959, when the "A" ordinary capital was converted into ordinary capital, the holders of the old capital received a 2 per cent scrip issue.

Walsall Conduits, Ltd.—The report and accounts for 1959 now issued confirm the figures given in our last issue.

In his accompanying statement, Mr. C. G. Maisey (chairman) says that there was a substantial increase in turnover for the year, although the trading profit did not increase in the same proportion in consequence of rising costs, keen competition and diminution of profit margins. They continue to extend their sales organisation in this country and during the year opened and stocked three more depots, bringing the total to forty-three. Export trade continues to be hampered by currency and other restrictions in overseas markets. In order to increase the range and quality of their products at competitive prices, the directors continue to add to and improve the plant, equipment and accommodation and further substantial extensions are envisaged in the near future. The year showed a welcome revival in the demand for ceramics and the operations of the subsidiary, A. G. Hackney & Co., Ltd., resulted in a satisfactory increase in sales and profits. The improvement has continued in the present year with the prospect of even better results for 1960. The group sales for the current year to date continue to rise and in the absence of any unforeseen circumstances the directors view the future with confidence.

Greenwood & Batley, Ltd.—After providing £97,881 for taxation, the net profit for the year ended 31st March last is £122,199, as compared with £141,104 for the preceding year. The dividend for the year is maintained at 30 per cent by a final payment of 20 per cent and £30,000 is placed to general reserve.

The Automatic Telephone & Electric Co., Ltd., is to make a rights issue of 3,240,000 ordinary 5s shares at 15s each on the basis of one for every five 5s units held. The directors state that the results for 1960 should justify the maintenance of the ordinary dividend at 17 per cent.

Mirrlees Watson Co., Ltd.—The profits for the year ended 31st March last amounted to £142,461, as compared with £243,440 for 1958-59. After deducting £67,127 for taxation, the net profit of the parent company is £77,559 (against £117,417). The dividend for the year is maintained at 15 per cent, and the balance carried forward is £57,698 (against £51,437 brought in).

The Greengate & Irwell Rubber Co., Ltd., reports a group net profit for the year to 31st March last of £161,365, as compared with £192,384 for the preceding year. Capital reserves receive £49,720 and general reserve £50,000. It is proposed to pay a final dividend of $7\frac{1}{2}$ per cent, making $12\frac{1}{2}$ per cent for the year (against 10 per cent), and to carry forward £123,264 (against £188,328 brought in). The directors state that trading results for the second half-year have shown considerable improvement, which is continuing.

Ultra Electric (Holdings), Ltd., reports group profits for the year to 26th March last of £616,508, as compared with £404,720 for the preceding year, and after deducting £288,825 for taxation, the net balance is £327,683 (against £206,890). It is proposed to pay a final dividend of $17\frac{1}{2}$ per cent, making 25 per cent for the year (against 20 per cent). The new shares under the recent rights issue do not rank for the 1959-60 dividends. The directors anticipate the maintenance of a dividend of 25 per cent for 1960-61.

International Combustion Africa, Ltd., has declared an interim dividend of 10 per cent (against 20 per cent) on doubled capital.

Dewhurst & Partner, Ltd., are paying an interim dividend of 5 per cent (unchanged).

New Companies

Baird Television, Ltd.—Registered 18th May. Capital £100. Manufacturers of apparatus and equipment for transmitting and receiving pictures and/or sound, etc. Directors: A. W. M. Hartley and P. L. Oliver (directors of Camp Bird Trading Co., Ltd., etc.). Regd. office: 39, Dover Street, W.1.

Govier & Poulter, Ltd.—Registered 24th March. Capital £1,000. Electrical engineers and general electrical installation contractors, etc. Directors: W. G. Govier and K. R. Poulter. Regd. office: 7, North Street, Luton, Beds.

Thompson & Knight, Ltd.—Registered 29th March. Capital £100. Manufacturers of and dealers in electrical goods, etc. Directors: E. Thompson and C. T. Knight. Regd. office: 15, Great Western Road, W.9.

Belgravia Electrics, Ltd.—Registered 5th April. Capital £100. General electricians, etc. Directors: R. W. Hollis, S. A. Mason, S. A. Pearson and M. L. De Pruski. Regd. office: 16, Denbigh Street, S.W.1.

Cleanercraft (Cardiff), Ltd.—Registered 5th April. Capital £5,000. Electrical engineers, etc. Directors: J. Hopkins and Lucy M. Singleton. Regd. office: 45, Crwys Road, Cardiff.

Teddington Autocontrols, Ltd.—Registered 20th April. Capital £100. Manufacturers of and dealers in domestic, industrial and engineering, controlling, indicating or recording

[*Continued on page* 1237

B.R.S. MEET 24-HOUR EXPORT DEADLINE

Friday a.m. Branch Manager J. Webster warned of rush job.

Saturday a.m. Wool delivered to docks at Hull.

Told on Friday–in the hold Saturday

Friday noon. Driver briefed.

Friday p.m. Loading under way.

Saturday a.m. Wool leaves Bradford.

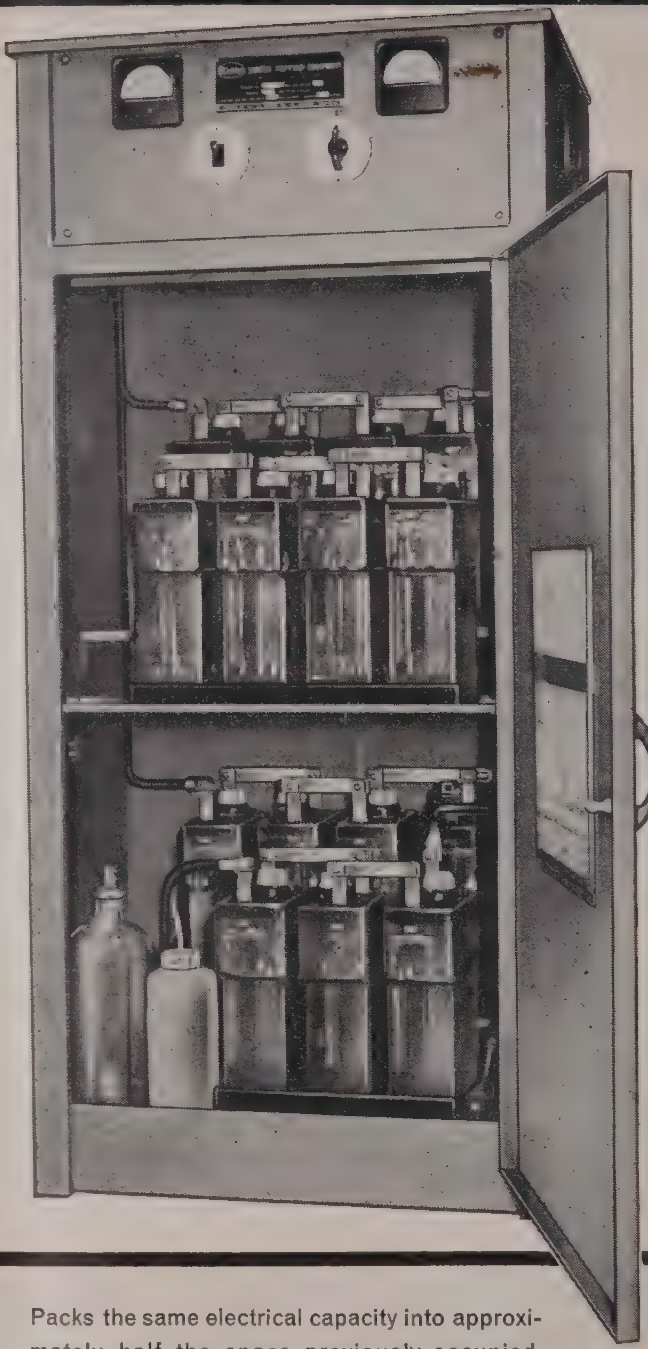
Saturday a.m. Wool at docks.

Saturday noon. Wool aboard, ship sails.

B.R.S. had 24 hours to get this urgent consignment to the ship. They made it with time to spare. Jobs like this are all part of the normal service. Their clients know this and count on B.R.S. for punctual deliveries. W. N. Pollack Ltd., of Brearton Street, Bradford, Wool Exporters (whose wool it was), wrote this to B.R.S. . . . "The fact that we can remember no instance when you have failed to deliver our consignments on time speaks very highly of your organisation and drivers . . . our sincere thanks."

To get things moving– get B.R.S.

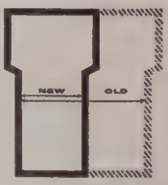
YOU'LL FIND THEM IN THE 'PHONE BOOK



NEW
TUDOR
SELF-CONTAINED SWITCH-TRIPPING EQUIPMENT

The famous Tudor switch-tripping equipment is now being constructed to an improved design, and is being supplied with either the 10Ah B.S.S. cell or the new High Performance cell of 15 or 30 Ah capacity.* The cubicles are now available either in folded sheet steel, or alternatively in a wooden cabinet fitted with a glass panelled door. The charger which is incorporated into the equipment is now suitable for both trickle and quick charging. The Tudor self-contained switch-tripping equipment is constantly at the ready in power plants, sub-stations, and many other places where loading is intermittent and an unfailing emergency supply is essential in case of temporary mains interruption. The equipment is easily maintained and throughout the years has proved unceasingly reliable.

*The new Tudor High-Performance Cell



Packs the same electrical capacity into approximately half the space previously occupied. It maintains its remarkable length of life with complete reliability, and working efficiency has been increased.

Improved features of the Tudor 'Safetylyte' Emergency Lighting Equipment

Safetylyte equipments also are now being fitted with the new stationary cell. Charge and control cubicles are of improved design—the larger equipments being of folded sheet steel, and the smaller specially constructed for wall-mounting, employing automatic mercury relay in place of a contactor.

T175

Tudor **SELF-CONTAINED SWITCH-TRIPPING EQUIPMENT**

THE D.P. BATTERY CO. LTD., *manufacturers of Kathanode and Tudor Batteries* · **BAKEWELL, DERBYSHIRE**
Telephone Bakewell 581-5

FINANCIAL SECTION—*continued*

apparatus for heating, lighting, cooking, cleaning, purifying, washing, refrigeration, air conditioning and all other applications, etc. Directors: J. E. Sherlock, S. S. A. Sherlock and R. H. Seward. Regd. office: 146, Windmill Road, Sunbury-on-Thames, Middx.

Sellecks of Plympton, Ltd.—Registered 14th April. Capital £1,000. Electrical engineers, etc. Directors: W. D. Selleck and Barbara M. Selleck. Regd. office: St. Marys Bridge, Plympton.

Washer Services & Supplies Co., Ltd.—Registered 13th April. Capital £2,000. To acquire the business of electrical contractors carried on by Washer Services & Supplies Co., at Stockport, Ches., etc. Directors: S. Y. Bebbington and Lily Bebbington. Regd. office: 116, Higher Hillgate, Stockport.

D. J. Humphrey (Electrical Contractor), Ltd.—Registered 14th April. Capital £100. Electrical engineers and contractors, etc. Directors: D. J. Humphrey and Mrs. Toinnette L. Humphrey. Regd. office: Barclays Bank Chambers, Grand Parade, Harringay, N.4.

Colman's Electrical, Ltd.—Registered 19th April. Capital £1,000. Electrical engineers, etc. Directors: E. Colman and Mrs. Agnes Colman. Regd. office: 137, York Street, Heywood, Lancs.

Marsh & Crapper, Ltd.—Registered 28th March. Capital £100. Electrical engineers and general electrical installation contractors, etc. Directors: J. A. Marsh and J. N. Crapper. Regd. office: 24, Norfolk Row, Sheffield, 1.

Gwinnutt, Ltd.—Registered 25th March. Capital £2,000. To acquire the business of electrical engineer and contractor carried on by D. F. Gwinnutt at Cardiff, etc. Directors: D. F. Gwinnutt and F. G. Gwinnutt. Regd. office: Rear of 2, Llanishen Street, Cardiff.

Birmingham Home & Office Telephone Co., Ltd.—Registered 25th March. Capital £100. Directors: R. Schneider, Sally David Cramer and P. Saloman. Regd. office: 176, Broad Street, Birmingham, 15.

Pye T.V.T., Ltd.—Registered 22nd March. Capital £100. Manufacturers, sellers, hirers, repairers, installers and operators of and dealers in radio and television transmitting and receiving equipment, etc. Solicitors: Few & Kestor, Cambridge.

R. I. Fairgrieve, Ltd.—Registered 21st March. Capital £500. Manufacturers of and dealers in electrical apparatus, etc. Directors: R. I. Fairgrieve and Mrs. May Fairgrieve. Regd. office: 332, Kingston Road, Ewell.

E. L. Firby, Ltd.—Registered 28th March. Capital £2,000. Maintaining and repairing electric motors, electrical engineers, etc. Directors: E. C. Firby and Doris Firby. Regd. office: 511, Garratt Lane, S.W.18.

T. F. Browne, Ltd.—Registered 28th March. Capital £1,000. To acquire the business of an electrical engineer and contractor carried on by T. F. Browne at Stanion, Kettering, etc. Directors: T. F. Browne and Mrs. Phyllis Browne. Regd. office: 16, High Street, Stanion, Northants.

J. M. Wardle & Co., Ltd.—Registered 8th April. Capital £100. Designers, development and research specialists, patentees, manufacturers of and dealers in mechanical, electrical, electromechanical, electronic and nuclear equipment, etc. Directors: J. M. Wardle and Elsie E. Wardle. Regd. office: 5, New Quebec Street, Marylebone, W.1.

Whix (Electric), Ltd.—Registered 5th May. Capital £100. Manufacturers of and dealers in all kinds of domestic appliances, etc. Directors: A. Barakan and J. S. Hayes. Regd. office: 119, City Road, E.C.1.

Gray (Domestic Electrical Appliances), Ltd.—Registered 27th April. Capital £2,000. Electricians, electrical and mechanical engineers and manufacturers of electrical machinery, etc. Directors: J. Gray and Mrs. Lily Gray. Regd. office: Folly Bank Farm, Crawshawbooth, Rossendale, Lancs.

Godwin & Crossman, Ltd.—Registered 13th May. Capital £4,500. To acquire the business of electrical engineers and contractors heretofore carried on by R. F. J. Godwin, Winifred A. Godwin and C. J. Crossman at 140, High Street, Street. Directors: R. F. J. Godwin, Winifred A. Godwin and C. J. Crossman. Regd. office: 140, High Street, Street, Som.

Alfred Crane & Co., Ltd.—Registered 16th May. Capital £5,000. Manufacturers of and dealers in domestic and general electrical equipment, etc. Directors: A. Crane, Mrs. Nellie D. Crane and W. Harris. Regd. office: 77, Streatham Hill, S.W.2.

T. Garland & Son, Ltd.—Registered 13th May. Capital £2,000. Manufacturers of and dealers in artificial lighting apparatus, electrical instruments, etc. Directors: T. Garland and Mrs. N. Garland. Regd. office: Alexandra Buildings, 31, Lloyd Street, Manchester, 2

Crown Electric, Ltd.—Registered 13th May. Capital £1,000. Directors: A. G. Holland and J. Blake. Regd. office: 15, Crown Street, Failsworth, Manchester.

Hatch Bros. (Electrical), Ltd.—Registered 17th May. Capital £500. Directors: D. R. Hatch and D. V. Hatch. Regd. office: 176, High Street, Ponders End, Enfield, Middlesex.

E. A. Dolan, Ltd.—Registered 26th April. Capital £1,000. Electrical engineers and contractors, etc. Directors: A. Dolan and Mrs. Kathleen Dolan. Regd. office: 269a, Kingsland Road, E.2.

Brian & Rogers, Ltd.—Registered 27th April. Capital £1,000. Electrical engineers and contractors, etc. Regd. office: 46/7, Chancery Lane, W.C.2.

Liquidations

Carowe Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. B. Britcliffe, 15, Avenue Parade, Accrington. Particulars of claims to the liquidator by 7th July. This notice is purely formal. All known creditors have been, or will be, paid in full.

Lamberts (Farnham Road), Ltd., electrical retailers, 48, Market Place, Reading.—Winding up voluntarily. Joint liquidators, Mr. G. Talfourd-Cook, 64-65, St. Mary's Butts, Reading, and Mr. R. A. Hawken, Bank Chambers, 1, John Street, Bedford Row, London, W.C.1, appointed 3rd June. Particulars of claims to the liquidator by 23rd July.

D. F. Saint, Ltd., wholesalers, retailers and repairers of electric and domestic appliances, 7, Victoria Road, Darlington.—Winding up voluntarily. Liquidator, Mr. D. T. Bainbridge, 7, Victoria Road, Darlington, appointed 8th June. Particulars of claims to the liquidator by 29th July.

Loughton Radio & Electrical Co., Ltd.—Meeting 22nd July at the offices of John Baker, Sons & Bell, 88, Leadenhall Street, London, E.C.3, to receive an account of the winding-up by the liquidator, Mr. L. J. W. Gould.

Bankruptcies

H. I. Saffer, lately trading as H. I. Saffer at 91, Tabernacle Street, London, E.C.2, and at 158, Stoke Newington Church Street, London, N.16, as H.S. Electrical Appliances, dealer in electrical appliances.—Receiving order made 1st June on debtor's own petition. Public examination 22nd July at Bankruptcy Buildings, Carey Street, London, W.C.2.

W. B. Brookes, formerly carrying on business as an electrical contractor at 147, Chellaston Road, Shelton Lock, Derbyshire.—Receiving order made 2nd June on debtor's own petition. Public examination 9th August at the Court House, 20, St. Peter's Church Yard, Derby.

C. Davies, 39, Moss Brow, West Bollington, near Macclesfield, Ches., electrical contractor.—Receiving order made 7th June on a creditor's petition. Public examination 4th October at the Town Hall, Macclesfield.

D. G. Mayell, 82, Park Road, Freemantle, Southampton, trading as Electroservice, electrical contractor and domestic appliance retailer.—Receiving order made 9th June on debtor's own petition.

CATALOGUES AND LISTS

BATTERIES.—Leaflet describing the "Exide-Ironclad" traction batteries.—**Chloride Batteries, Ltd.**, Clifton Junction, Manchester.

BELT DRIVES.—Catalogue (26 pages) covering "Poly-V" belt drives and a 50-page catalogue dealing with rubber conveyor belting.—**Turner Brothers Asbestos Co., Ltd.**, Rochdale, Lancs.

BOILER REFRACTORIES.—Leaflet on refractories for land boilers.—**Morgan Refractories, Ltd.**, Neston, Wirral, Cheshire.

CONTROL GEAR.—Catalogue (96-pages) containing data and illustrations of the "S and S" range of control gear, including contactors rated from 15 to 600 A and direct-on-line, star-delta and stator-rotor starters.—**Simplex Electric Co., Ltd.**, Creda Works, Blythe Bridge, Staffs.

CURRENT COLLECTORS.—Brochure dealing with "Morganite" carbon current collectors for use with wires or rails.—**Morgan Crucible Co., Ltd.**, Battersea Church Road, London, S.W.11.

DOMESTIC APPLIANCES.—Brochure (16-pages) illustrated in colour, covering the company's range of domestic electrical appliances and containing a separate retail price list.—**Morphy-Richards, Ltd.**, 50, Conduit Street, London, W.1.

DOOR OPENING GEAR.—Leaflet describing the "Magi-Dor" automatic remote control opening unit for domestic garage doors.—**Kinetrol, Ltd.**, Trading Estate, Farnham, Surrey.

DUST COLLECTOR.—Brochure (3504) giving particulars of the "Newgate" dust collector.—**Sturtevant Engineering Co., Ltd.**, Southern House, Cannon Street, London, E.C.4.

ELECTRIC FENCES.—Booklet entitled "The Facts about Paddock Grazing" containing particulars of the company's electric fencer and describing its application for this form of grazing.—**Wolseley Engineering, Ltd.**, Electric Avenue, Witton, Birmingham, 6.

FANS.—Illustrated 24-page catalogue (3505) dealing with fans for mechanical draught.—**Sturtevant Engineering Co., Ltd.**, Southern House, Cannon Street, London, E.C.4.

GAS TURBINES.—Descriptive booklet (GT/104) containing information on the EM85 gas turbine.—**English Electric Co., Ltd.**, Whetstone, near Leicester.

HYGROMETERS. — Leaflet illustrating and describing hygrometers produced by the company.—**Shaw Moisture Meters**, Rawson Road, Bradford, Yorkshire.

INDICATOR LAMPS.—Leaflet describing miniature lamphousings intended for applications where it is undesirable that the lamp cover or lamp should be removable from the front of the panel.—**Electro Methods, Ltd.**, Hitchin Street, Biggleswade, Bedfordshire.

LIGHTING EQUIPMENT.—Priced 92-page catalogue illustrating and describing the company's range of industrial and commercial lighting equipment.—**Simplex Electric Co., Ltd.**, Creda Works, Blythe Bridge, Staffs.

RECTIFIERS.—Brochure (120) covering silicon rectifiers produced by the company.—**Lancashire Dynamo Nevelin, Ltd.**, Hurst Green, Oxted, Surrey.

Illustrated pamphlet giving information on electric vehicle battery charging rectifiers.—**Electro-Automat, Ltd.**, Moorside Road, Swinton, Manchester.

RELAYS.—Looseleaf catalogue containing particulars of the B. and R. range of relays, with technical specifications and notes on the application of the various types.—**B. & R. Relays, Ltd.**, Temple Fields, Harlow, Essex.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1955

994. Birlec, Ltd.—Electric furnaces. 12th April, 1956. (836982.)

5381. Rae, T. L.—Electrically operated drive device. 23rd May, 1956. (836775.)

11167. Lincoln Electric Co., Ltd.—Electric arc welding equipment. 17th July, 1956. (836983.)

16454. British Telecommunications Research, Ltd.—Crystal controlled oscillators. 7th September, 1956. (836782.)

16657. Morgan Crucible Co., Ltd.—Electric current collecting brushes and collectors. 7th June, 1956. (Cognate application 28137, 3rd October, 1955.) (836984.)

17427. British Thomson-Houston Co., Ltd.—Apparatus for determining the thermal conductivity of liquids. 18th June, 1956. (836784.)

18563. Baldwin, H. T.—Earth leakage control apparatus employing a transformer having a closed magnetic core. 27th June, 1956. (836986.)

20181. British Thomson-Houston Co., Ltd.—Control arrangements for electric motors. 10th October, 1956. (836785.)

22180. British Thomson-Houston Co., Ltd.—Electrical waveguide systems. 20th July, 1956. (837192.)

22814. British Thomson-Houston Co., Ltd.—Electric winder control systems. 1st August, 1956. (836699.)

23603. Burndept, Ltd.—Battery lamps and the like. 16th August, 1956. (836700.)

25313. Parsons & Co., Ltd., C. A.—Dynamo-electric machines. 16th August, 1956. (837097.)

27950. Reyrolle & Co., Ltd., A.—Electric motor control means for nuclear reactors. 28th September, 1956. (836975.)

28441. Reyrolle & Co., Ltd., A.—Electric generators. 27th September, 1956. (836976.)

32623. English Electric Co., Ltd.—Circuit-breakers having magnetically operated actuators. 9th November, 1956. (836703.)

35562. Dirks, G.—Electric pulse generators. 12th March, 1957. (837195.)

1956

5937. Dirks, G.—Electric calculators. 24th May, 1957. (837196.)

9135. Philips Electrical Industries, Ltd.—Automatic signalling systems. 23rd March, 1956. (836583.)

9417. British Insulated Callender's Cables, Ltd.—Apparatus for the manufacture of coaxial cables. 25th March, 1957. (836623.)

9441. Dirks, G.—Electric calculators. 27th March, 1956. (837197.)

9547. Maecker, K. (trading as Elektro-Antrieb K. Maecker).—Fully automatic electrical control for a crankshaft milling machine. 27th March, 1956. (837098.)

10134. Mullard Radio Valve Co., Ltd.—Semiconductive devices. 3rd April, 1956. (836585.)

10135. Mullard Radio Valve Co., Ltd.—Electric discharge tubes. 3rd April, 1956. (836586.)

10301. Olympic Cables Proprietary, Ltd.—Repair, joining and termination of insulated electric cables and the like. 4th April, 1956. (836587.)

11032. British Thomson-Houston Co., Ltd.—Circuits for the protection of pulse receivers from the effects of high power pulses. 11th April, 1957. (836589.)

12227. Electrocircuits, Inc.—Method and apparatus for measuring wave propagation time. 20th April, 1956. (837274.)

13256. National Research Development Corporation.—Cathode-ray tubes. 30th April, 1956. (836881.)

14285. Siemens & Halske A.G.—Electric wave filters. 8th May, 1956. (837275.)

17378. Morgan Crucible Co., Ltd.—Electric current collectors. 7th June, 1956. (Divided out of 836984.) (836985.)

17792. Werk für Signal- und Sicherungstechnik Veb.—Gas or vapour filled cold cathode discharge vessel. 8th June, 1956. (836710.)

17875. Siemens-Schuckertwerke A.G.—Variable resistance devices. 8th June, 1956. (837278.)

18170. Varian Associates.—Velocity modulation electron tube apparatus. 12th June, 1956. (836871.)

18443. Sangamo Weston, Ltd.—Magnetic suspensions. 14th June, 1956. (836800.)

19006. Sylvania Electric Products, Inc.—Method of forming a cathode-ray tube viewing panel. 19th June, 1956. (837280.)

19081. Philco Corporation.—Electrolytic treatment of semiconductor bodies. 20th June, 1956. (836595.)

19904. General Electric Co.—Circuit arrangement for detecting faults in three-phase systems. 27th June, 1956. (836805.)

19949. Toledo Scale Corporation.—Electronic multiplier. 27th June, 1956. (836806.)

21012. Philips Electrical Industries, Ltd.—Transmission systems for television signals. 6th July, 1956. (836601.)

21050. General Electric Co.—Apparatus for brazing commutator connections. 6th July, 1956. (837003.)

21052. General Electric Co.—Coil winding apparatus. 6th July, 1956. (837284.)

21589. Vyzkumny a Zkusebni Letecky Ustav.—Transducer converting a mechanical torque into electric current. 12th July, 1956. (837288.)

23138. Philips' Gloeilampenfabrieken N.V.—Apparatus for the reproduction of colour television images. 26th July, 1956. (836712.)

23150. General Electric Co.—Semiconductor relaxation oscillators. 26th July, 1956. (836602.)

23335. Reyrolle & Co., Ltd., A.—High voltage circuit-breakers. 27th July, 1956. (Addition to 756074.) (837004.)

23649. Sperry Rand Corporation.—Logical circuits using transformers. 31st July, 1956. (837005.)

24061. Varian Associates.—Electron tube apparatus. 3rd August, 1956. (837292.)

24546. Standard Telephones & Cables, Ltd.—Image reproducing device. 10th August, 1956. (837206.)

25408. Peebles & Co., Ltd., B., and Paton, R.—Electrical windings. 19th August, 1957. (836604.)

26406. Siemens & Halske A.G.—Electric gate circuits. 29th August, 1956. (837297.)

26557. Fox, B.—Electrical two-part connectors. 30th August, 1956. (836606.)

29118. Igranic Electric Co., Ltd.—Control systems for power operated forming presses. 24th September, 1956. (836607.)

29392. Philips Electrical Industries, Ltd.—Amplifying circuit arrangements employing transistors. 26th September, 1956. (836894.)

30015. Collins Radio Co.—Multiple frequency communication system. 2nd October, 1956. (836824.)

30333. Kelvin & Hughes, Ltd.—Electromagnetic testing of materials. 12th November, 1957. (836723.)

30608. Eitel-McCullough, Inc.—Electron tube. 8th October, 1956. (837303.)

32309. Telephone Manufacturing Co., Ltd.—Polarised electromagnetic relays. 14th November, 1957. (Cognate application 1017, 10th January, 1957.) (836987.)

32745. Sperry Rand Corporation.—Gating circuits employing saturable magnetic cores. 26th October, 1956. (837212.)

33603. Walsall Conduits, Ltd.—Bulkhead type lighting fittings. 31st October, 1957. (837214.)

34114. Tesla, Narodni Podnik.—Tool for stripping insulation from electric conductors. 8th November, 1956. (837014.)

35356. Sylvania Electric Products, Inc.—Electron guns. 19th November, 1956. (837102.)

36644. Hunt (Capacitors), Ltd., A. H.—Manufacture of electrical capacitors and other electrical components. 29th November, 1957. (Cognate application 24942, 7th August, 1957.) (837310.)

37164. Licentia Patent-Verwaltungs G.m.b.H.—Electromagnetic oscillating compressor. 5th December, 1956. (837312.)

37523. General Electric Co., Ltd.—Photo-electric smoke indicating apparatus. 9th December, 1957. (836613.)

39300. Philips Electrical Industries, Ltd.—Processes for the electro-deposition of metals. 27th December, 1956. (836731.)

39485. General Electric Co.—Pinhole detection apparatus. 28th December, 1956. (836616.)

39574. Ericsson Telephones, Ltd.—Multi-position rotary electric switching devices. 29th December, 1956. (836832.)

1957

438. Philips Electrical Industries, Ltd.—Intermediate frequency amplifiers for colour television receivers. 4th January, 1957. (837219.)

5052. Withnell, Ltd., A. C.—Control systems for electrically propelled vehicles. 9th May, 1958. (836900.)

6805. General Electric Co., Ltd.—Cooling arrangements. 28th February, 1958. (837022.)

8459. Philips Electrical Industries, Ltd.—Electric discharge valves. 14th March, 1957. (837024.)

8472. General Electric Co., Ltd.—Rectifier assemblies and supporting arrangements therefor. 14th March, 1958. (836904.)

9298. Philco Corporation. — Electro-deposition of metals. 21st March, 1957. (836908.)

11052. Limit Engineering Group, Ltd., and Collins, A. L.—Guards for electric fans and like structures. 1st April, 1958. (836626.)

11582/3. Stein & Atkinson, Ltd. (Christiania Spigerverk).—Electric heating elements for soaking pits or furnaces. 9th July, 1958. (837028/9.)

14796. Edgerton Germeshausen & Grier, Inc.—Gaseous discharge tubes. 9th May, 1957. (836918.)

15076/7. Arrow Electric Switches, Ltd.—Electromagnetic switches. 13th May, 1957. (836571/2.)

16571. Napier & Son, Ltd., D.—Electrical resistance strain gauges. 13th May, 1958. (836634.)

16514. General Electric Co., Ltd.—Impulsing mechanisms for telephone dials. 25th April, 1958. (837033.)

18033. British Insulated Callender's Construction Co., Ltd.—Supports for electric cables. 5th September, 1958. (836636.)

21181. Telephone Manufacturing Co., Ltd.—Arrangements for insulating metal screws or bolts. 26th June, 1958. (837234.)

21516. United States Atomic Energy

[*Continued on page* 1239

How efficient is a Power Station?

The term 'efficient' is often used loosely as an alternative to 'effective'. In Electricity Supply, however, the 'efficiency' of a power station has a well-defined and exact connotation. It indicates the heat energy expended to produce a unit of electricity.

Progressively, new power stations are more 'efficient' than their predecessors — they burn less coal for a given output. The engineers of the Central Electricity Generating Board are producing designs which, by increasing efficiency, enable power stations to offset substantially the rising costs of materials.

In spite of increased efficiency, however, the available supply of suitable coal cannot long keep pace with the demand for electricity, which doubles every decade. The gap that threatens in the not distant future will now be filled by the rapidly expanding nuclear power programme.

C.E.G.B.

THE CENTRAL ELECTRICITY GENERATING BOARD

The ram side of the 66 coke oven battery at Manvers Main

Courtesy of National Coal Board & Simon Carves Ltd

MICROsen again—

—— crops up everywhere and not only on cranes and hoists. In this case it is incorporated in E.M.B. Control Gear Equipment for locating the ram beam exactly opposite each oven to eject the red hot charge of coke. The MICROsen, which gives variable speeds ranging from 10% to full synchronous speeds, can be applied to any standard slip ring motor from 2 to 140 H.P.

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CONTRACTORS TO THE ADMIRALTY, CROWN AGENTS TO THE COLONIES, SUPPLY DEPARTMENTS, DOMINION AND OVERSEAS GOVERNMENTS

NEW PATENTS *(continued)*

Commission. Nuclear reactor. 8th July, 1957. (836843.)

22679. Metropolitan-Vickers Electrical Co., Ltd.—Electric welding circuit arrangements. 19th June, 1958. (836643.)

22723. Saint George's Engineers, Ltd.—Radiators for cooling electrical transformer tanks. 17th July, 1958. (836845.)

24899. Ardal og Sunndal Verk A.S.—Process for the protection of carbon electrodes for electric furnaces. 7th August, 1957. (837330.)

26301. Collins Radio Co.—Locking oscillator phase-pulse generator. 20th August, 1957. (836930.)

29332. Automatic Telephone & Electric Co., Ltd.—Dial switches for use in telephone systems. 6th August, 1958. (837137.)

30078. General Electric Co.—Semiconductor devices and methods of making same. 25th September, 1957. (836851.)

32073. General Electric Co., Ltd.—Electric lighting fittings. 13th October, 1958. (837336.)

32785. Haussauer, L. P.—Safety electric cut-out devices for water heaters. 19th September, 1958. (837047.)

32979. British Insulated Callender's Cables, Ltd.—Section insulators for use in overhead conductors or electric traction systems. 22nd October, 1958. (836656.)

33225. General Electric Co.—Form recognition system. 24th October, 1957. (837341.)

34169. Montecatini Soc. Generale per l'Industria Mineraria e Chimica.—Electric cables for telecommunication purposes. 1st November, 1957. (Addition to 810023.) (836660.)

34171. General Electric Co., Ltd.—Starting and operating electric discharge lamps. 17th October, 1958. (836611.)

35410. Siemens Edison Swan, Ltd.—Telephone exchange systems and the like. 4th November, 1958. (836935.)

36366. British Telecommunications Research, Ltd.—Oscillation generators. 14th November, 1958. (837148.)

38059. Siemens Edison Swan, Ltd.—Electric acoustic transducers. 19th November, 1958. (837149.)

38435. Electro-Air Cleaner Co., Inc.—Electronic air cleaner. 10th December, 1957. (837150.)

39956. Electrothermal Engineering, Ltd.—Low inductance wound resistors. 23rd December, 1958. (835973.)

1958

881. Marconi's Wireless Telegraph Co., Ltd.—Variable gain amplifiers. 17th September, 1958. (836077.)

1210. Demag-Elektrometallurgie G.m.b.H.—Tiltable electric arc melting furnace. 13th January, 1958. (836277.)

1807. Compagnie Générale de Télégraphie sans Fil.—Ceramic dielectric substances of high dielectric constant and low temperature coefficient. 20th January, 1958. (836481.)

2488. Collins Radio Co.—Servo tuning systems. 24th January, 1958. (836281.)

3325. Lignes Telegraphiques et Telephoniques.—Surface wave transmission lines. 31st January, 1958. (835976.)

5404. Western Electric Co., Inc.—Cathodes for electron discharge tubes. 19th February, 1958. (836291.)

6232. Telefonaktiebolaget L. M. Ericsson.—Circuit arrangements for polarised relays. 26th February, 1958. (836484.)

6364. National Industri A.S.—Arrangement for over-voltage protection for reactance coils or transformers with tappings. 27th February, 1958. (836293.)

6577. A.E.I.-Hotpoint, Ltd.—Electric cookers. 5th January, 1959. (836485.)

7448. Esab, Ltd.—Electrodes for electric arc welding and in methods of manufacturing same. 7th March, 1958. (836296.)

8951. Delta Welder Corporation.—Hydraulic electric resistance welding head. 20th March, 1958. (836492.)

10900. Siemens & Halske A.G.—Arrangements for correcting distortion in start-stop telecommunication systems. 3rd April, 1958. (836091.)

13575. Western Electric Co., Inc.—Networks of the bridged-T type. 29th April, 1958. (836096.)

14615. Philips Electrical Industries, Ltd.—Time switches embodying discharge tubes. 7th May, 1958. (836313.)

19809. Fernseh G.m.b.H.—Methods of measuring the frequency characteristics of pre-amplifiers associated with television camera tubes and television cameras especially adapted for carrying out this method. 20th June, 1958. (836331.)

21392. Materiel de Cablerie.—Apparatus for the continuous annealing of wires or cables. 3rd July, 1958. (835980.)

26507. Philips Electrical Industries, Ltd.—Dry shavers comprising at least two cutting plates. 18th August, 1958. (836346.)

29609. Ateliers de Constructions Electriques de Charleroi.—Electric switch for regulation under load. 16th September, 1958. (836522.)

30765. Ericsson Telephones, Ltd.—Means for paying out wire or the like in the winding of spools or bobbins. 26th September, 1958. (836528.)

31960. Pirelli S.p.A.—Connector for electric conductors of sector-shaped cross section. 7th October, 1958. (836535.)

34621. Allmänna Svenska Elektriska A.B.—Circuit arrangement for electric discharge lamps operated from a polyphase network. 29th October, 1958. (836532.)

37934. Mullard, Ltd.—Thermionic rectifiers. 25th November, 1958. (836548.)

39482. Siemens & Halske A.G.—Systems for the communication of multi-digit numbers. 8th December, 1958. (836102.)

39812. General Motors Corporation.—Radio amplifiers employing transistors. 10th December, 1958. (836103.)

40539. Philips Electrical Industries, Ltd.—Grid electrodes for use in electric discharge tubes. 16th December, 1958. (836105.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

8th July

Buckland. No. 781,883. Class 9. Electric accumulators and cases.—R. E. Buckland and L. C. Buckland, trading as Buckland Battery Co., Hersham Trading Estate, Walton-on-Thames.

Numericord. No. 783,526. Class 9. Electric and electronic apparatus for automatically controlling the operation of machine tools, etc.—Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., U.S.A. Address for service, c/o Edward Evans & Co., 53-64, Chancery Lane, London, W.C.2.

Buell. No. 796,114. Class 9. Valves operated automatically by electric current control, by solenoid, or by temperature and other changes in physical conditions.—Buell, Ltd., Imperial Steelworks, Sheffield, 9.

Resmet. No. 798,164. Class 9. Electrical contacts made of metal, electrodes for electric welding, and electrical switchgear.—Metro-Cutanit, Ltd., Grappenhall, Warrington, Lancs.

Ricohfax. No. 801,796. Class 9. Electrical and scientific apparatus and instruments, etc.—Riken Kogaku Kogyo Kabushiki Kaisha, Tokyo, Japan. Address for service, c/o Mathisen & Macara, 97, Jermyn Street, St. James's, London, S.W.1.

Huntalic. No. 801,808. Class 9. Capacitors.—A. H. Hunt (Capacitors), Ltd., Bendon Valley, Garratt Lane, Wandsworth, London, S.W.18.

Redibat. No. B801,904. Class 9. Batteries and accumulators.—Challenge Cycle & Motor Co., Ltd., Lark Hill Road, Worcester.

En-U-Larm. No. 796,313. Class 10. Electro-medical devices for use in treating enuresis.—Milliwatt, Ltd., 44, Princess Road, Regent's Park, London, N.W.1.

Varnite. No. 800,849. Class 17. Electrical insulation materials being steel in sheet or strip form and having an electrical insulation surface.—Steel Company of Wales, Ltd., Newport Division, Orb Works, Newport, Mon.

15th July

Minister. No. 795,342. Class 9. Portable electric vacuum cleaning apparatus, and parts.—Bylock Electric, Ltd., 109, South Street, Enfield, Middx.

Silver Star. No. 796,827. Class 9. Electrical capacitors.—Johnson, Matthey & Co., Ltd., 78, Hatton Garden, London, E.C.1.

Arcomet. No. 798,756. Class 9. Electrical contacts made of metal, electrodes for electric welding, and electrical switchgear.—Metro-Cutanit, Ltd., Grappenhall, Warrington.

A.M.C. (design). No. 801,665. Class 9. Scientific and electrical apparatus and instruments, etc.—Apparatus Manufacturing Co., Ltd., Southvale Works, Blackheath Village, London, S.E.3.

Stabkaps. No. 801,733. Class 9. Electrical capacitors.—Stability Capacitors, Ltd., Commerce Estate, Raven Road, London, E.18.

Dormy. No. 801,458. Class 10. Electrically heated blankets.—Wormalds & Walker, Ltd., Dewsbury Mills, Thornhill Road, Dewsbury.

Triga. No. 795,652. Class 11. Nuclear reactors and parts.—General Dynamics Corporation, New York, U.S.A. Address for service, c/o Boult, Wade & Tennant, 112, Hatton Garden, London, E.C.1.

Magni-Seal. No. 801,097. Class 11. Refrigerators and parts.—A.E.I.-Hotpoint, Ltd., 33, Grosvenor Place, London, S.W.1.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that dates for their functions do not clash with others already arranged

SATURDAY, 25th JUNE to FRIDAY, 8th JULY

London.—Olympia. International Machine Tool Exhibition.

MONDAY, 27th JUNE to FRIDAY, 1st JULY

Glasgow.—Central Hotel. Institution of Electrical Engineers. Summer meeting.

TUESDAY, 28th JUNE

Blackburn. — Combustion Engineering Association, North Western Region. Visit to Mullard, Ltd.

WEDNESDAY, 29th JUNE

London.—Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon. Guest speaker, G. Johnson Smith, M.P., on "Parliamentary Impressions."

WEDNESDAY, 29th JUNE and THURSDAY, 30th JUNE

Norwich.—Royal Norfolk Agricultural Show.

THURSDAY, 30th JUNE

London.—Highgate Golf Club. Electrical Industries Club. Golf meeting.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Armagh.—County Education Committee. 5th July. Electrical installation in Richmount School. G. D. Taylor, architect, 27a, English Street.

Australia.—Postmaster General's Department, Melbourne. 25th August. Cordless switchboards. (E.S.B. 15651/60.)*

Canada.—Saskatchewan Power Corporation. 23rd August. Three or four 75,000 kVA, 14·4-230 V main step-up transformers for Squaw Rapids. (E.S.B. 15597/60.)*

Claudy (Co. Londonderry).—5th July. Electrical installation in new voluntary secondary intermediate school. Varming & Mulcahy, 37, Malone Road, Belfast.

Consett.—U.D.C. 5th July. Street lighting equipment. (See this issue.)

Croydon.—Corporation. 15th July. Rewiring electrical installation at the Whitehorse Manor School. (See this issue.)

Dagenham.—Borough Council. 2nd July. Wiring of electric lighting and power points in 190 dwellings, Canvey Island development. Borough engineer and surveyor, Civic Centre, Dagenham.

Ethiopia.—Government Economic and Technical Assistance Board, Addis Ababa. 21st July. Two 17 kVA power plants for Makale Hospital. (E.S.B. 15589/60/I.C.A.)*

Fishguard and Goodwick.—U.D.C. Trunk road lighting equipment. (See this issue.)

Hastings.—Corporation. Electrical installation at St. Paul's Primary School. (See this issue.)

Ilford.—Corporation. 26th July. Stage 3 of lighting scheme for district roads. (See this issue.)

India.—Assam State Electricity Board, Shillong. Outdoor structures, switchgear, control and protective apparatus for Sumar power station. (E.S.B. 15522/60.)*

Delhi Corporation. 1st August. 12-panel, 11 kV, 3-phase, 500 MVA switchboard. (E.S.B. 15571/60.)*

Director General, Supplies and Disposals, New Delhi. 8th July. Switchboard wire. (E.S.B. 15503/60.)* 12th July. Aluminium conductors and accessories. (E.S.B. 15501/60.)*

Hindustan Steel, Ltd., Orissa. 22nd July. Telecommunication equipment. (E.S.B. 15501/60.)*

India Store Department. 18th July. Billet heating electric furnaces. (See this issue.) 9th August. "Hot" line tools and accessories for Andhra Pradesh State Electricity Board. (See this issue.)

Kerala State Electricity Board, Trivandrum. 11th July. Intake gates, hoists and intake pipes for Sholayar and Panviar hydro-electric projects. (E.S.B. 15572/60.)*

Lichfield.—City Council. 8th July. Group "A" street lighting equipment. (See this issue.)

Llanelly.—Corporation. 30th June. Connecting electricity supply to street lighting columns. (See this issue.)

Manchester.—City Council. 1st July. Electrical installation in day nursery at Daisy Bank Road, Victoria Park. City architect, P.O. Box 488, Town Hall.

New Zealand.—G.P.O., Wellington. 29th July. Connectors, plugs, jacks, lamps, sockets, switches and mounting strips. (E.S.B. 15518/60.)*

Portuguese East Africa.—Ports, Railways and Transport Department, Lourenço Marques. 1st July. Automatic telephone exchange equipment. (E.S.B. 15528/60.)*

Sunderland.—Corporation. 14th July. Electrical installation in a community centre being built at Monkwearmouth. Borough architect, Grange House, Stockton Road.

Thailand. — Telephone Organisation, Bangkok. 8th July. P.v.c. cable, two conductors, galvanised telegraph and telephone wires and bridle wire. (E.S.B. 15583/60.)*

Uruguay.—Administracion General de las Usinas Electricas y los Telefonos del Estado. 27th July. Trunk telephone cables and accessories. (E.S.B. 15536/60.)*

Yorkshire.—West Riding County Council. 11th July. Sodium lighting installation. (See this issue.)

ORDERS PLACED

Bootle. — Corporation. Recommended. Electrical wiring of the Town Hall and Municipal Offices, Central Library, Central Police Station and Balliol Road Baths, and certain other work (£42,965).—Grierson.

Bridport.—Wessex Regional Hospital Board. Recommended. Electrical work at Port Bredy Hospital (£4,180).—H. W. Smith & Son.

Glasgow.—British Railways, Scottish Region. Electrical installation, Perth new marshalling yard.—James Scott & Co. (Electrical Engineers).

Poole.—Wessex Regional Hospital Board. Recommended. Electrical services for new ward block and extension to the nurses' home, Poole General Hospital (£34,996).—Poole Electrics.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aintree.—Factory (£1,500,000) for British Enka, Ltd.; Holland & Hannen and Cubitts, Ltd., builders, Bromborough.

Bath.—Three/four-storey block of shops and flats, Barton Street; city planning officer, 7, North Parade Buildings.

Birmingham.—Buildings for Faculty of Science and Commerce; Howell, Killick & Partridge, architects, 82, South Hill Park, London, N.W.3.

Caterham.—Research centre and clinical laboratory; Marie Curie Memorial Foundation, 124, Sloane Street, London, S.W.1.

Chatham.—Offices, laboratories and stores; Spembly Engineering, Ltd., New Road Works.

Chesterfield.—Houses (70), Peveril estate; borough engineer, Town Hall.

Eastleigh (Hants.).—Old people's bungalows (30); E. J. Tapley, borough engineer, Town Hall.

Enfield.—Four ward kitchens and lift, St. Michael's Hospital; W. G. Plant, regional architect to Hospital Board, 40, Eastbourne Terrace, London, W.2.

Epsom.—Dwellings (46), Ruxley Farm estate; E. & J. Cotton, Ltd., High Street, Iver, Bucks.

Falkirk.—Municipal chambers, Westbank (£300,000); A. Currell, burgh architect.

Gateshead.—Four-form entry schools for boys and girls (£362,000), R. C. school at Wrekenton (£132,000), infants' school at Hendon Road (£42,000) and junior school at Chester Place (£54,000); G. F. Winters, borough engineer.

Guildford.—Theatre, Millmead; Scott, Brownrigg & Turner, architects, 32, London Road.

Hanworth.—Service buildings, London Airport; Eagle Aviation, Ltd., 40, Edgware Road, London, W.2.

Harlow.—Eight-storey office block; Kirk & Kirk, Ltd., Atlas Works, Putney, S.W.15.

Hemel Hempstead.—Junior, mixed and infants' schools, Wariners End Farm (£113,089); C. H. Aslin, county architect, County Hall, Hertford.

Hereford.—Houses (159), Newton Farm; N. Roberts, city architect.

Heston.—Air training centre for B.E.A. (£500,000); Holland & Hannen and Cubitts, Ltd., 1, Queen Anne's Gate, S.W.1.

Inverness.—Houses (36), Caol, near Fort William; county architect, The Castle, Inverness.

Kirkby.—Factory and offices for British Motor Corporation, Ltd., Birmingham; Holland & Hannen and Cubitts, Ltd., Chester Road, Bromborough.

Manchester.—Dwellings (326), Miles Platting estate; city architect.

Offices, Mosley Street; Harry S. Fairhurst & Son, architects, 55, Brown Street.

Houses (351), Cheadle; director of housing, Room 228, Town Hall, 2.

Morden.—Assembly hall, Tudor Drive; W. S. Scott, architect, Morden Hall, Merton, S.W.19.

North Riding.—Clinic and health office, Scarborough; county architect, County Hall, Northallerton.

Northumberland.—Smallholdings, including houses and farm buildings, West Heddon (£88,000); county architect, County Hall, Newcastle-on-Tyne.

Oxford.—Extension to Queen Elizabeth House, St. Giles (£75,000); R. E. Enthoven, architect, 4, Raymond Buildings, London, W.C.1.

Peterlee (Co. Durham).—R.C. junior school; D. Brown, architect, 10, Lambton Road, Jesmond, Newcastle-on-Tyne.

Rickmansworth.—Houses (48) and flats (48), Maple Cross estate; surveyor, Urban Council Offices.

Sandwich.—Houses (36), Hazelwood Meadow site; borough surveyor, Council Offices, Sandwich, Kent.

Seaham.—Flats (64), Station Road; A. Barratt, surveyor.

Shipley.—Factory and offices; Moore, Johnston, Ltd., 154/6, Sunbridge Road, Bradford.

Flats (45), Valley Road; surveyor, Town Hall, Shipley, Yorks.

Slough.—R.C. church, Bath Road; Arthur Farebrother & Partners, architects, 99, Seymour Grove, Manchester, 16.

Tow Law (Durham).—Houses (28); North Eastern Housing Association, 5, Windsor Terrace, Newcastle-on-Tyne.

Wakefield.—Development of Manygates Hospital (£127,000); secretary, Leeds Regional Hospital Board, Park Parade, Harrogate.

Watford.—R.C. church, Carpenders Park; Abbiss & Hale, Ltd., builders, Mill End, Rickmansworth.

Wimborne.—Flats (32), Greenclose estate; R. K. Brett, architect, 5, West Street.

Wolverhampton. — Teachers' training college, Chapel Ash; Lavender, Twentyman & Percy, architects, 35, Waterloo Road.

Yeadon.—Terminal buildings, Leeds and Bradford Airport; Norman & Dawbarn, architects, 7, Portland Place, London, W.1.

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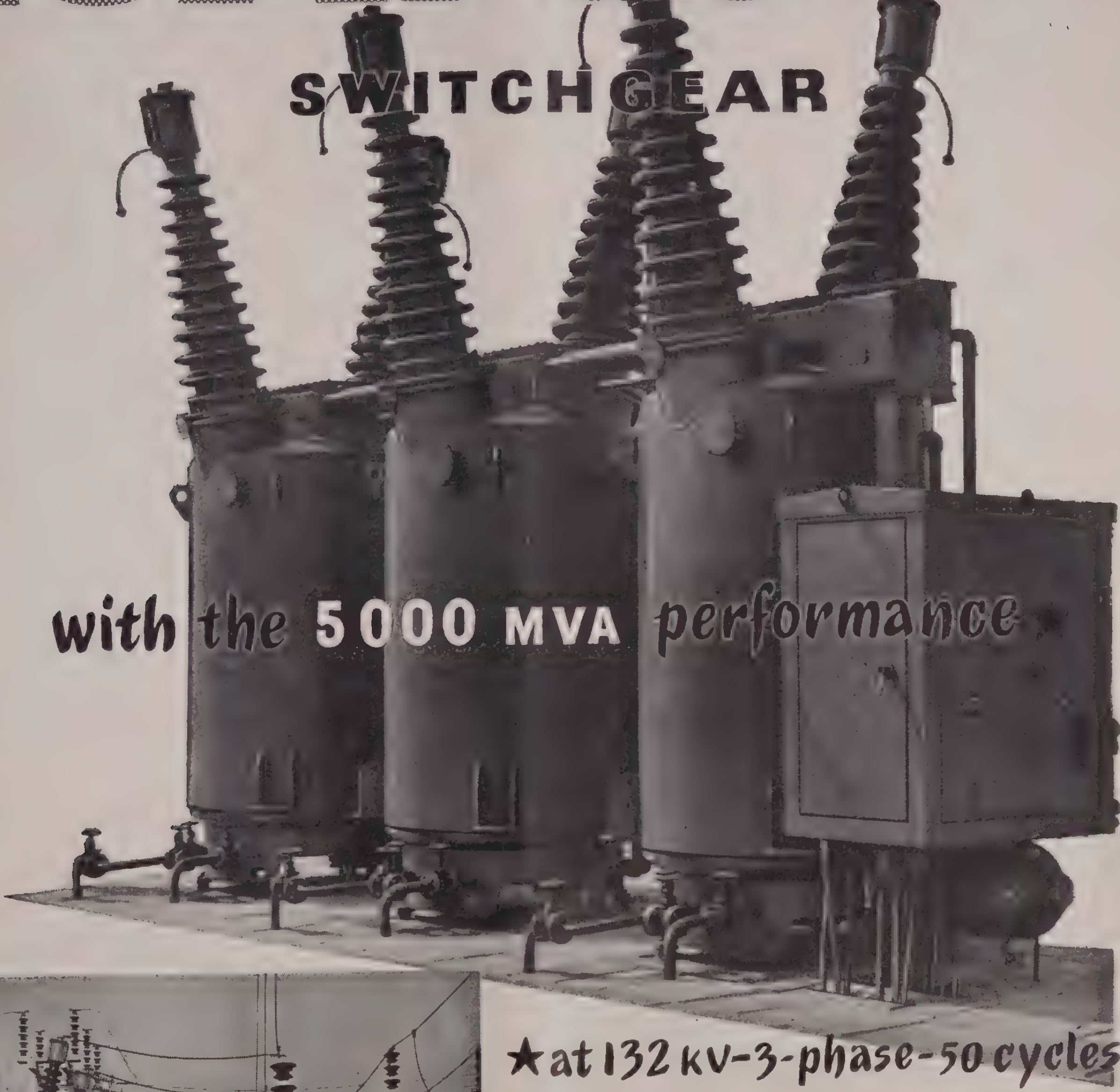
* This information is extracted from the Board of Trade *Export Service Bulletin*. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

TYPE

XOPR 60

SWITCHGEAR



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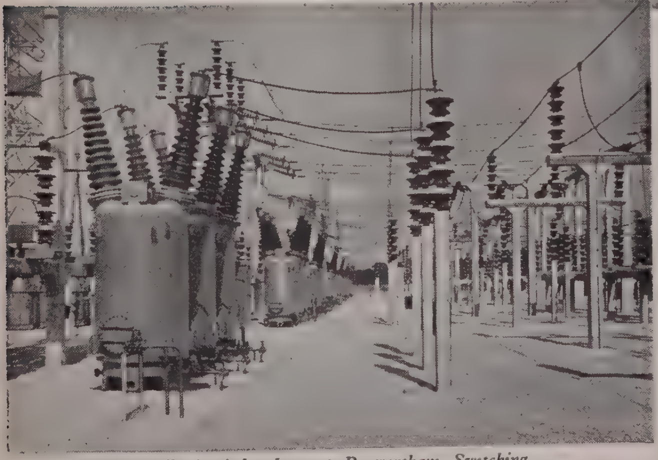
★at 132 kV-3-phase-50 cycles



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The challenge presented by the need for bulk-oil circuit-breakers capable of dealing with the higher fault levels now experienced through the 'Supergrid' has been adequately met by the introduction, at many points in the supply system, of the Type XOPR 60 circuit-breaker.

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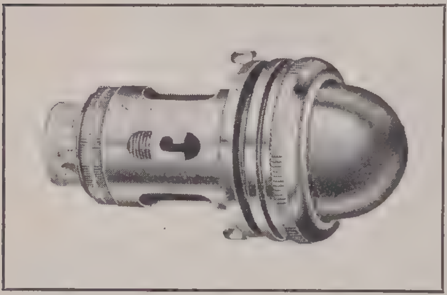

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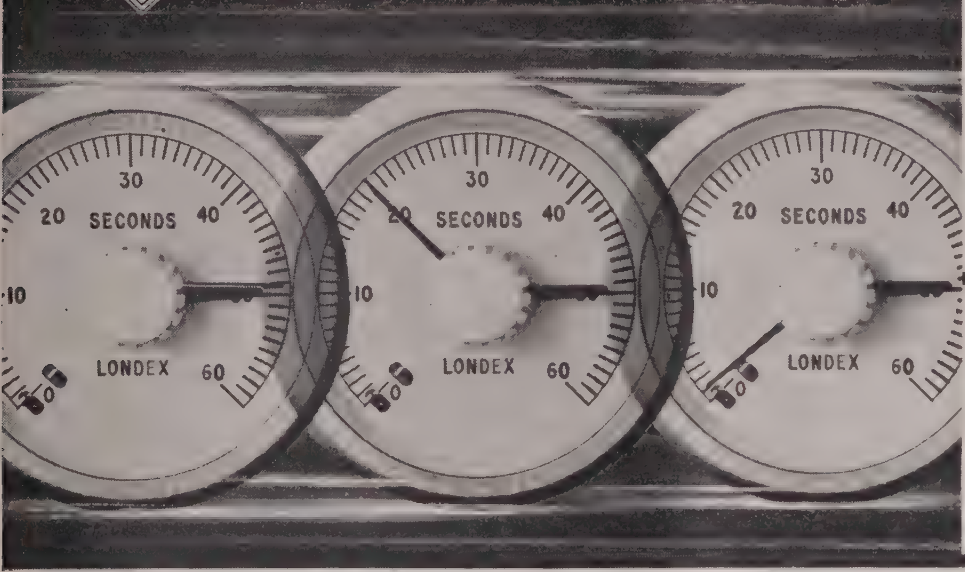

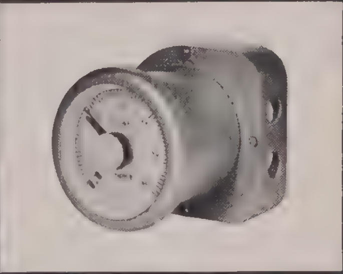

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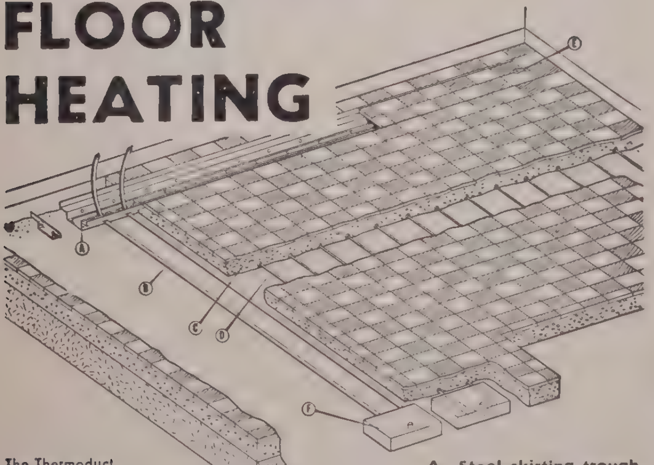

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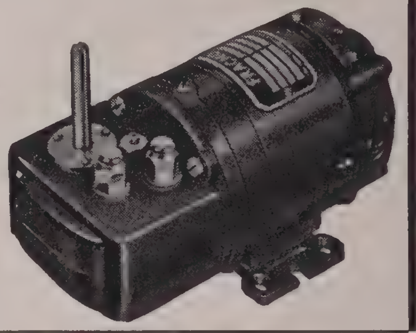

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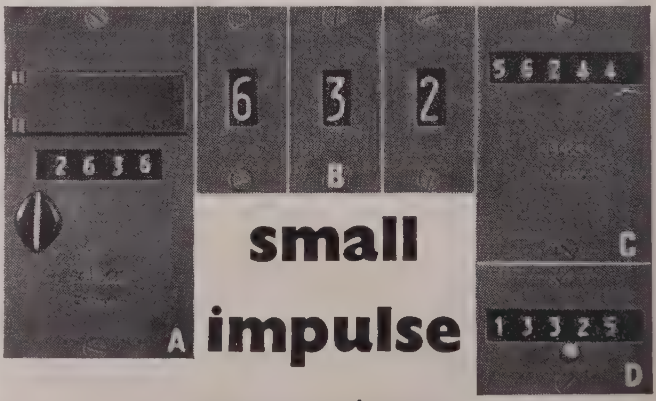

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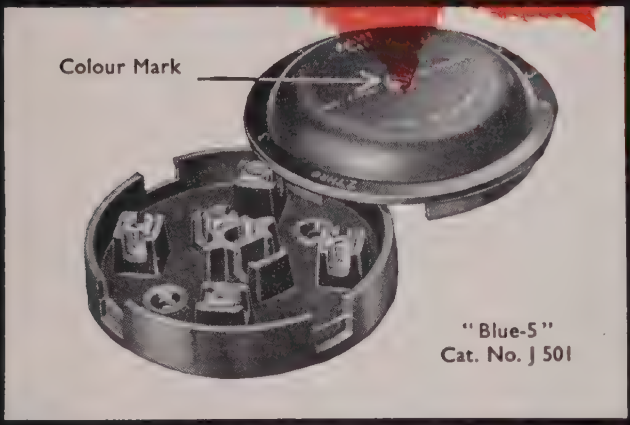

"Blue-5"
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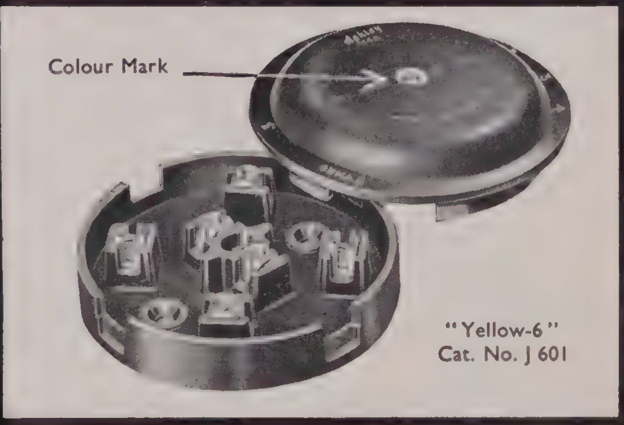

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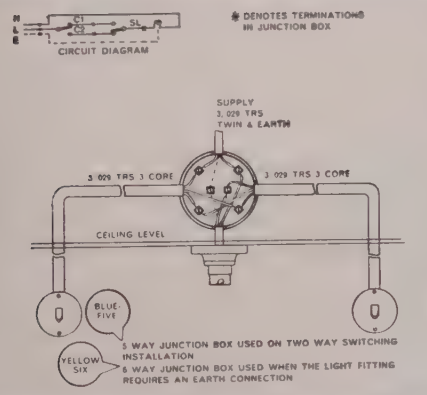
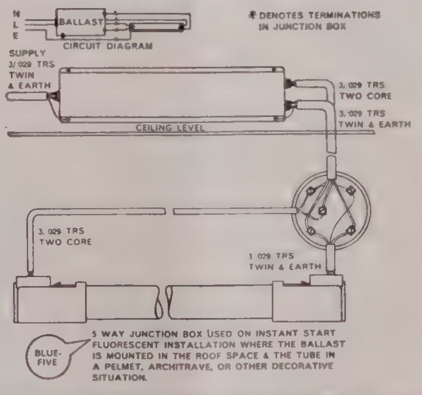


5 WAY JUNCTION BOX USED ON TWO WAY SWITCHING INSTALLATION

6 WAY JUNCTION BOX USED WHEN THE LIGHT FITTING REQUIRES AN EARTH CONNECTION



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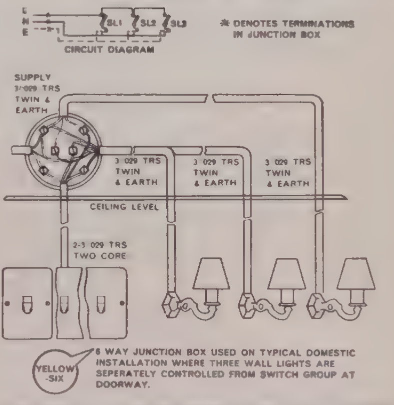

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Diameter 3¼". Height 1$\frac{1}{32}$". Fixing Centres 2".

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J 602	,, ,, ,, ,, Cream	36/-

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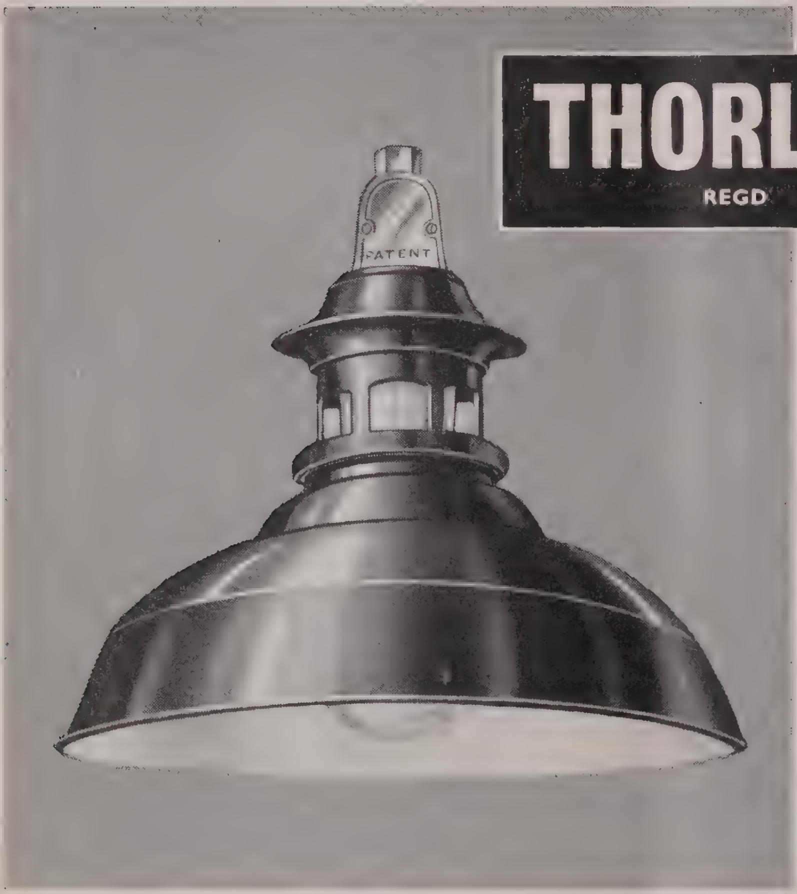

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The illustration shows the THORLUX Ventilux Overlamp Reflectors. The Patent "Koolesi" Wiring Box for cable entry not only provides a simple method of wiring the fitting, but also ensures that the incoming cables are kept cool. The funnel of the top unit has openings in the side which allows the hot air and dust rising past the lamp to escape, thereby keeping the reflector cleaner longer. The Overlamp Reflector is removed for cleaning by a "lift and turn" action, the fragile lamp being left in position.

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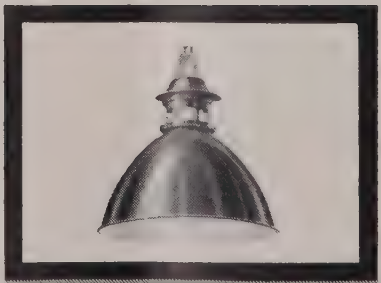
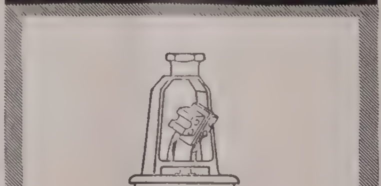


Ventilux Reflectors for all Tungsten and Mercury discharge lamps including 80/1000 watt (MBF/U.) Mercury-fluorescent.



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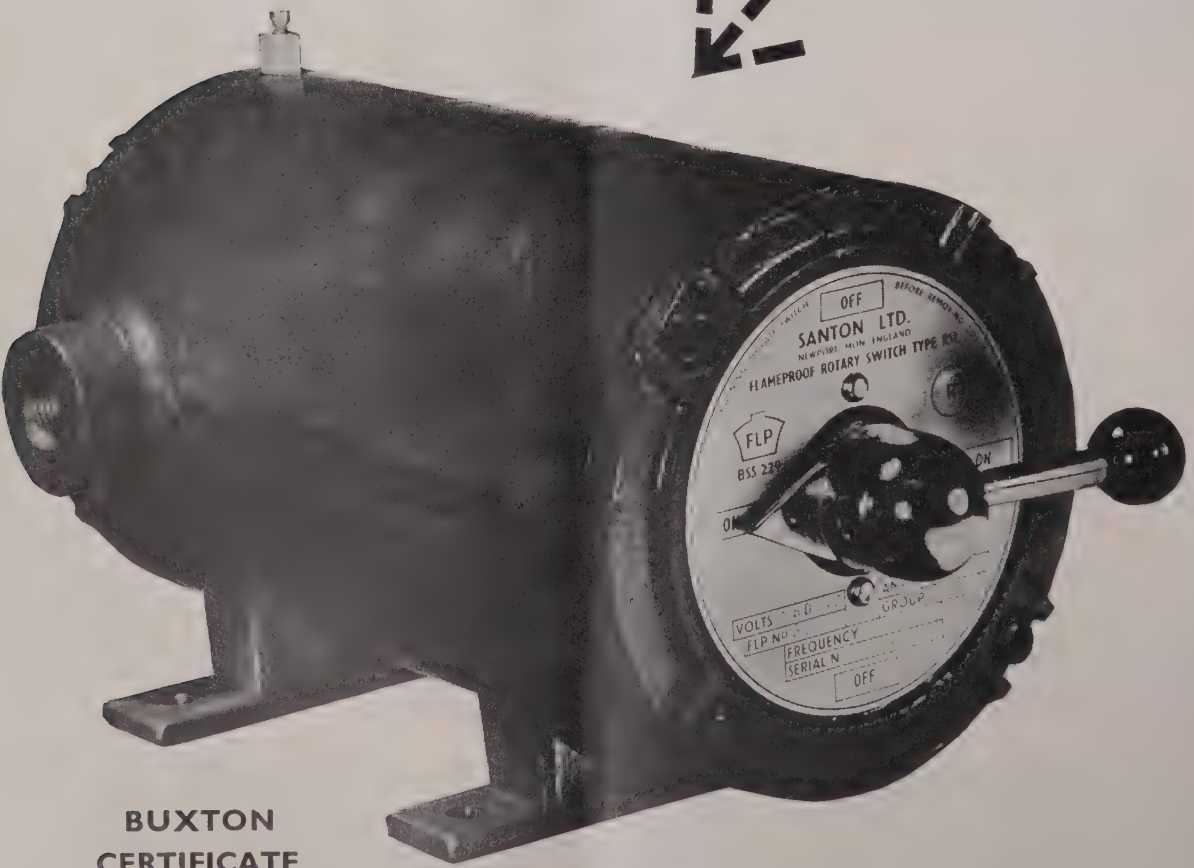

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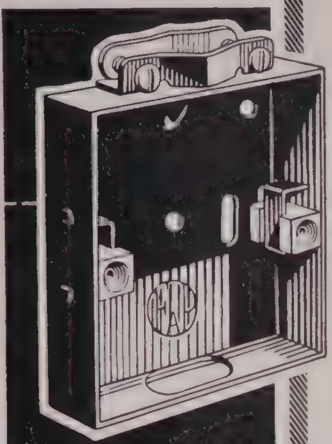

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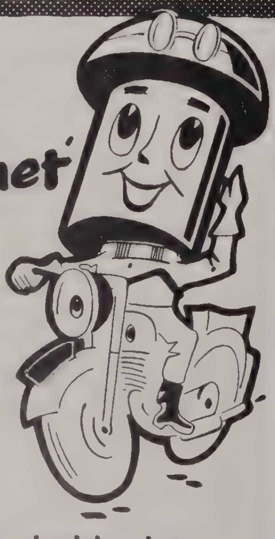

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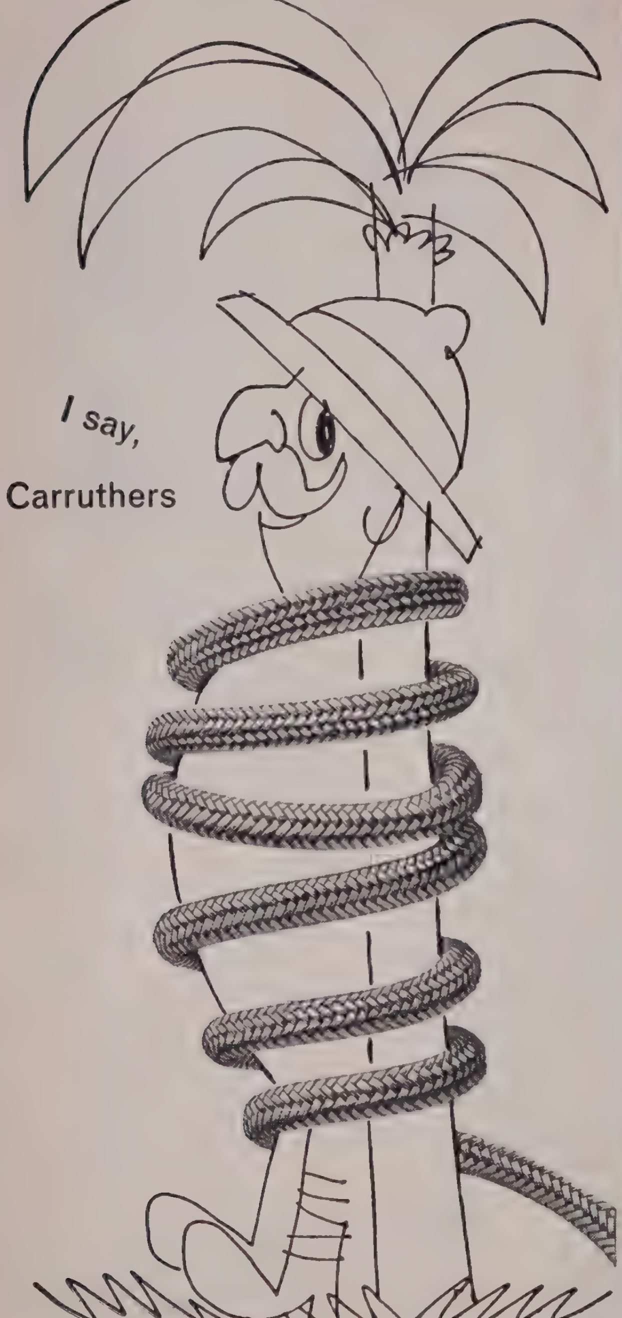

You've got to hand it to these fellahs. Awfully up to date and all that. Bright of them to think of wire braiding for a job like this. Jolly strong, jolly flexible and too jolly reliable for comfort. Daresay it's those Sparklets chappies — *they* make wire braiding for practically everything.

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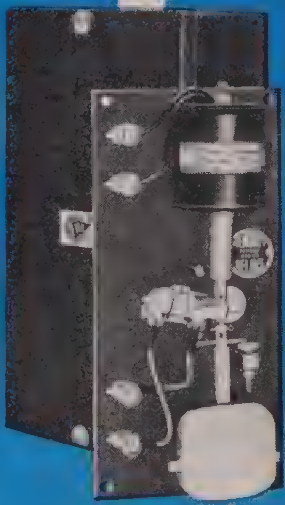
when seconds count . . .

HENDREY TIME DELAY RELAYS



Type MSTD
Time delay:
Any fixed period in the range of approx. 2-10 seconds.

Type MSTD Inverted
Time lag:
Mechanica escapement.
Ranges:
As Type MSTD but delay period commences when coil is de-energised.

Type DCMTD
Time lag:
Mechanica escapement.
Ranges:
3-5 seconds
5-15 seconds
15-20 seconds

A.C. Adjustable Timer
Time delay:
By Synchronous Motor. Min. setting 10% of maximum. Shortest Period 10 seconds. Max. setting up to several hours.

Type SS Synchronous
Time delay:
By Synchronous Motor, from a few seconds to many minutes.

Type DSS Synchronous
Time delay:
As Type SS. Synchronous but with two time delayed circuits.

The Range of Hendrey Time Delay Relays covers a wide field, and types are available permitting time delays from a few seconds to several hours.

The MSTD Relay illustrated above is one of the most popular types in the range and finds a wide variety of applications in industry. Time lag is by mechanical escapement. The following ranges of time delays are available: 3-5 seconds, 5-15 seconds, 15-30 seconds, 30-60 seconds. The period of delay is readily adjustable within the limits specified and commences immediately the coil is energised. The switches however do not operate until the selected delay has expired, and can be arranged either to "make" or "break" as desired.

For full details and specification ask for the appropriate Catalogue Sheet.

Hendrey Relays

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MANUFACTURING ELECTRICAL ENGINEERS CONTROL AND LABORATORY APPARATUS A.I.D. AND A.R.B. APPROVED

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Reyrolle

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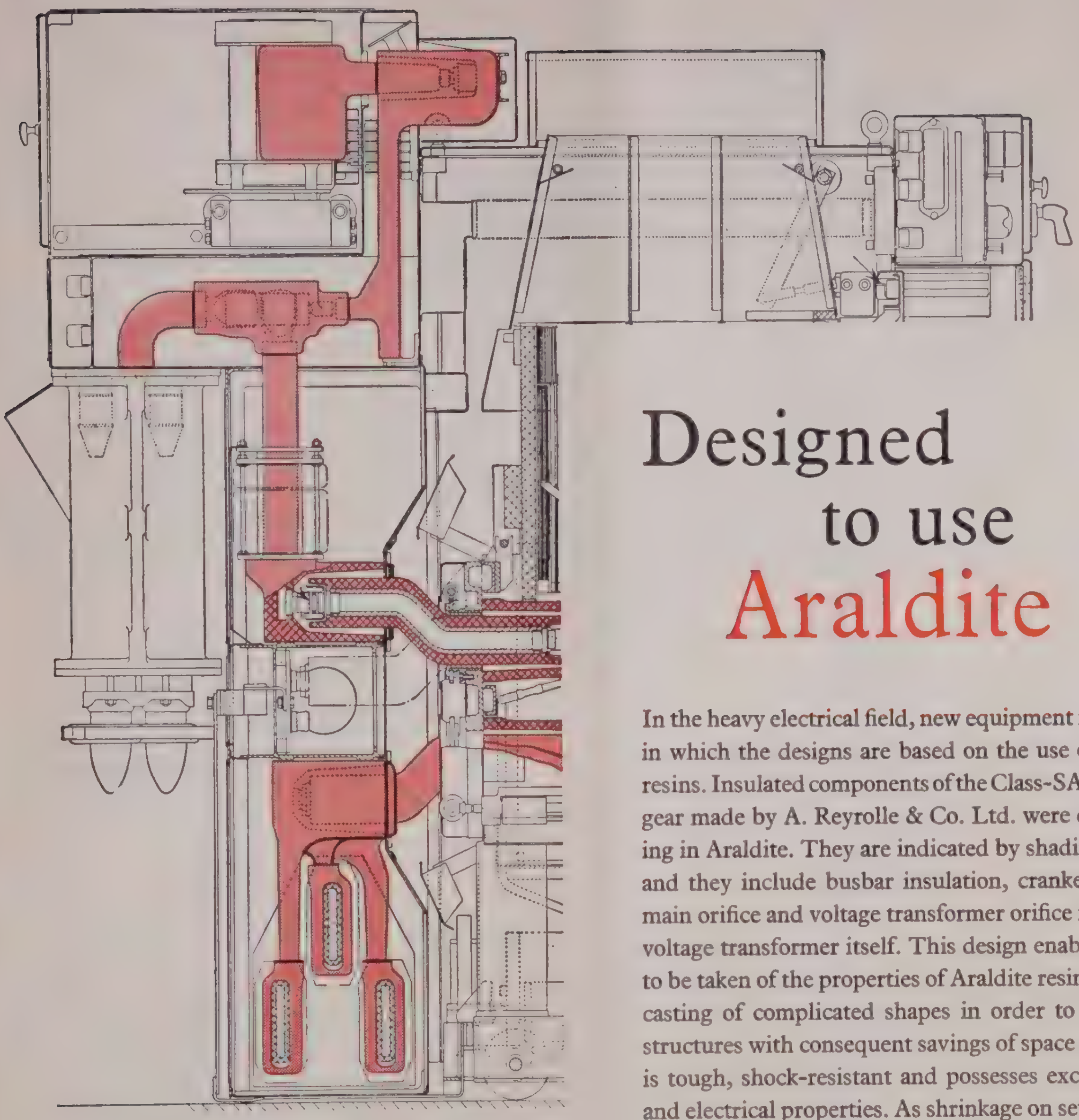

Designed to use Araldite

In the heavy electrical field, new equipment is being produced in which the designs are based on the use of Araldite epoxy resins. Insulated components of the Class-SA air-break switchgear made by A. Reyrolle & Co. Ltd. were designed for casting in Araldite. They are indicated by shading in the diagram and they include busbar insulation, cranked plug insulator, main orifice and voltage transformer orifice insulators and the voltage transformer itself. This design enables full advantage to be taken of the properties of Araldite resins which allow the casting of complicated shapes in order to provide compact structures with consequent savings of space and cost. Araldite is tough, shock-resistant and possesses excellent mechanical and electrical properties. As shrinkage on setting is negligible, dimensional accuracy can be maintained within very close limits. Remarkable adhesion to metals makes Araldite particularly suitable for composite structures.

Insulated components of 11,000V Class-SA
500 MVA air-break switchgear by
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Araldite is a registered trade name

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AP541

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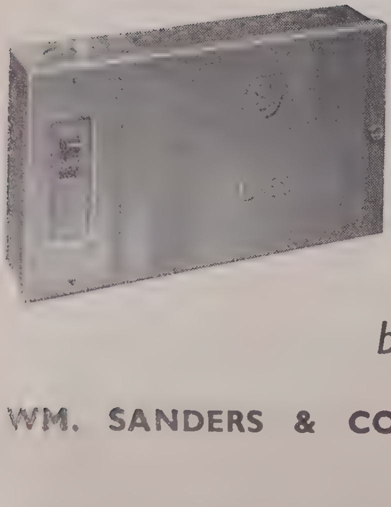
PRICES & DETAILS, SEE LEAFLET 59/59



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WM. SANDERS & CO. (WEDNESBURY) LTD., WEDNESBURY, STAFFS.

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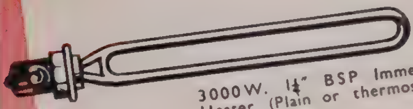

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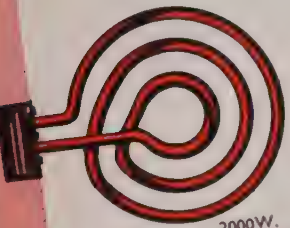

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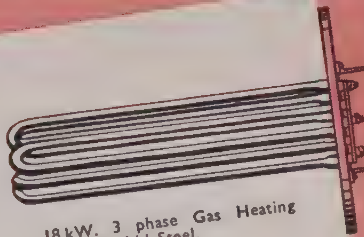

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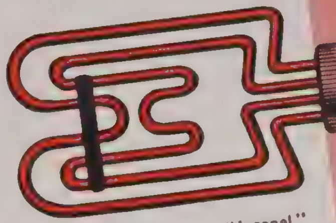

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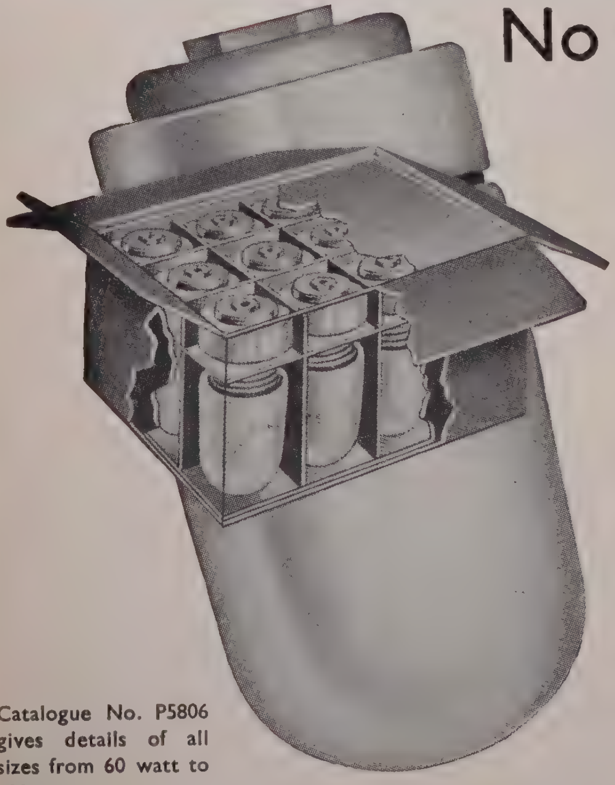

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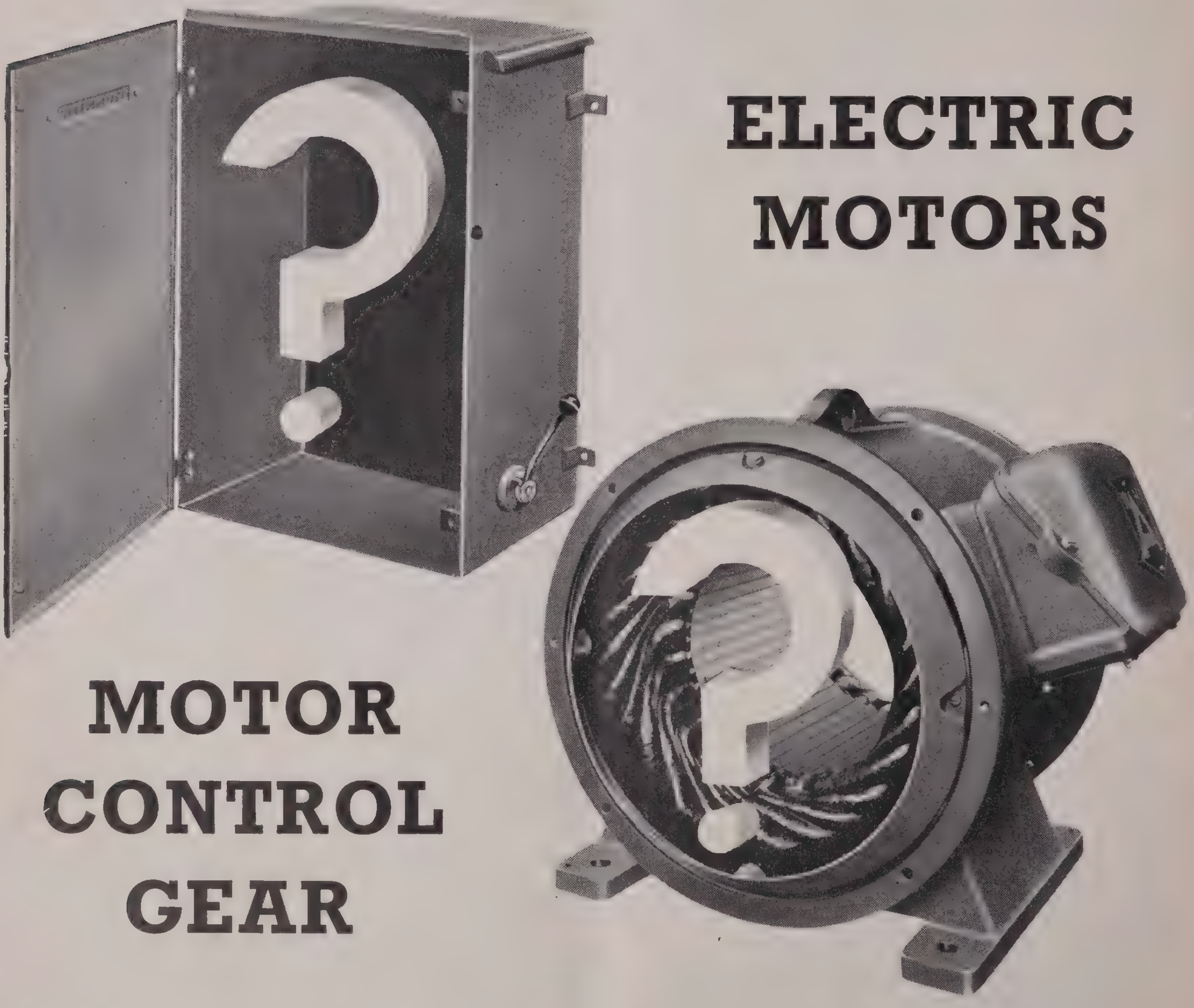

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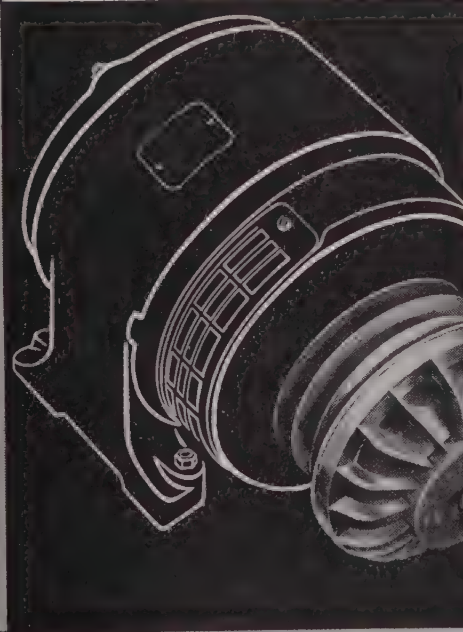

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The motor of load.

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AND MAKING TRANSFORMERS

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Since the earliest days of A.C. distribution, the Crompton Parkinson works have produced a vast number of transformers . . . which have been proved in use throughout the world. The types currently in production range from small instrument transformers to huge power transformers used on the world's high-voltage transmission systems. Within this range are air-cooled and fire-resistant types, all built to the same high standard and each incorporating the long experience of Crompton Parkinson Ltd.

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ELECTRICAL EQUIPMENT

Makers of Electric Motors of all kinds, A.C. and D.C. Generators, Switchgear, B.E.T. Transformers, Cables, Instruments, Lamps, Lighting Equipment, Batteries, Stud Welding Equipment, Traction Equipment, Ceiling Fans.

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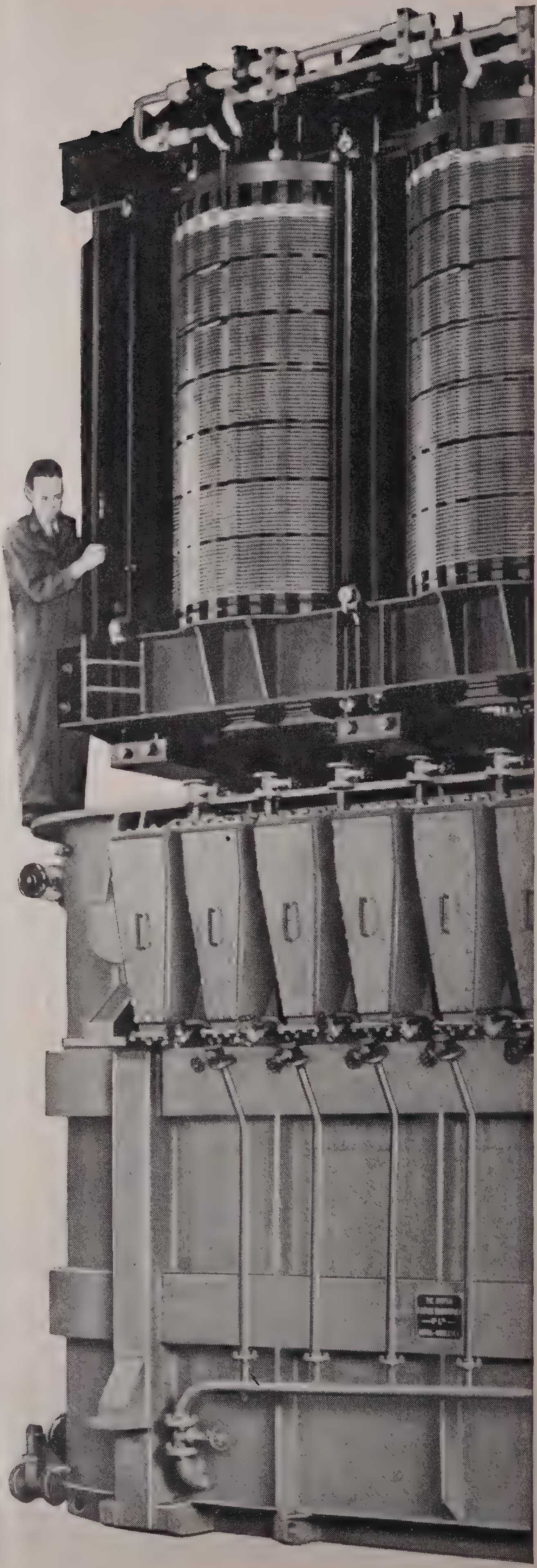
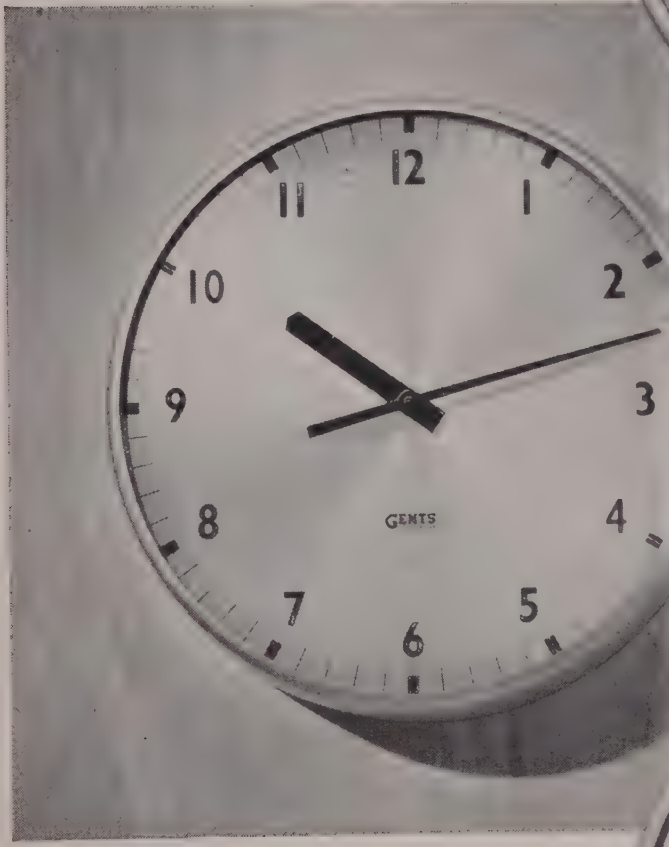


Maximum legibility and good taste are combined in the Gents wall clocks shown here.

Styled by a leading industrial designer they provide a choice of standard models which fit happily into present-day surroundings and décor.

These and others in the extensive Gents range have been selected by the Council of Industrial Design for inclusion in Design Index.

All are available for operating either on A.C. Mains or as part of a Master Clock System.



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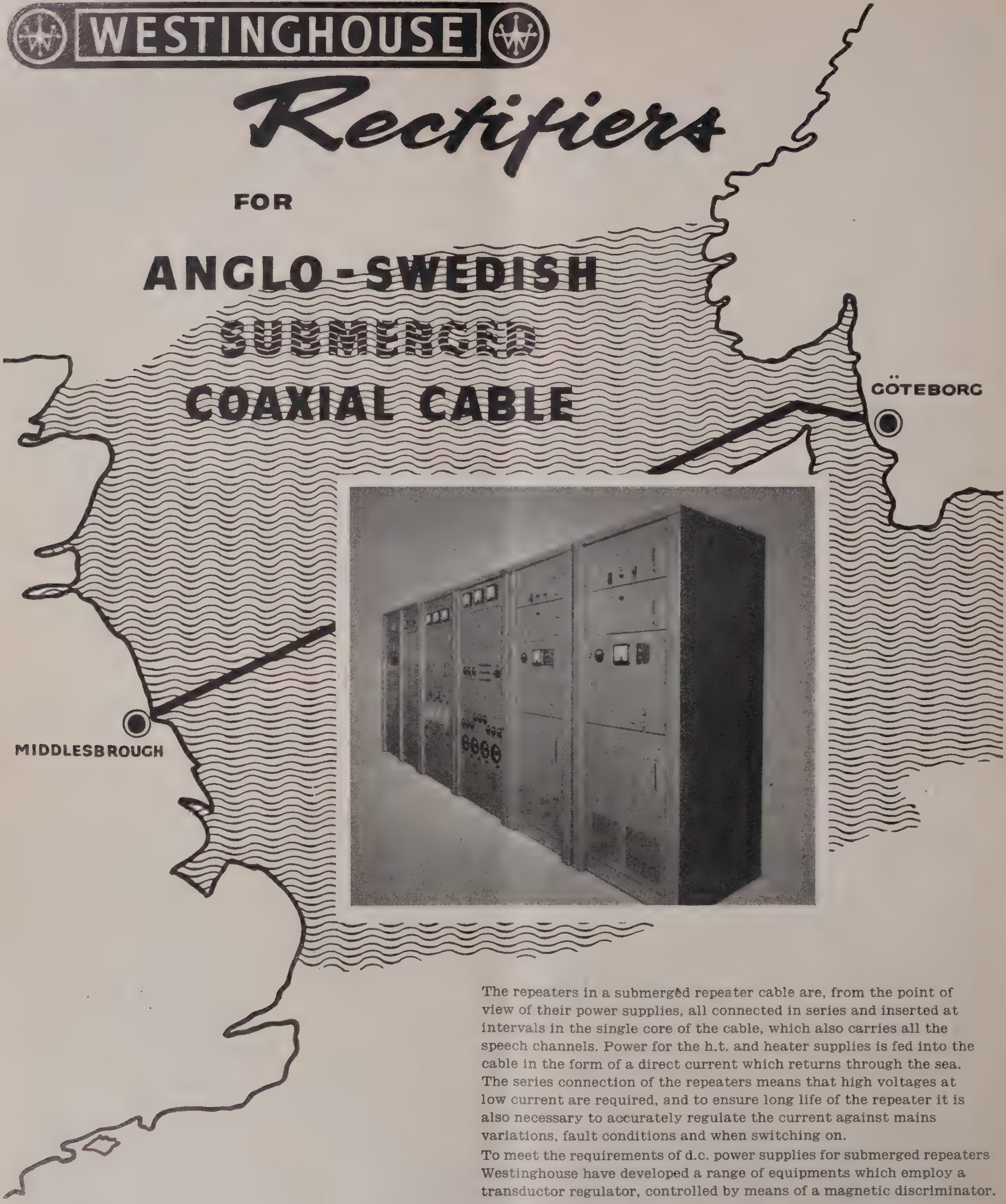
Rectifiers

FOR

ANGLO-SWEDISH SUBMERGED COAXIAL CABLE



The repeaters in a submerged repeater cable are, from the point of view of their power supplies, all connected in series and inserted at intervals in the single core of the cable, which also carries all the speech channels. Power for the h.t. and heater supplies is fed into the cable in the form of a direct current which returns through the sea. The series connection of the repeaters means that high voltages at low current are required, and to ensure long life of the repeater it is also necessary to accurately regulate the current against mains variations, fault conditions and when switching on.

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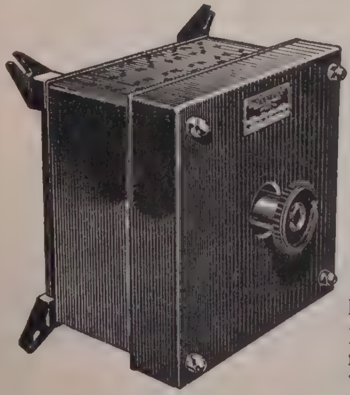

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"Colne" **ISOLATOR SWITCHES**

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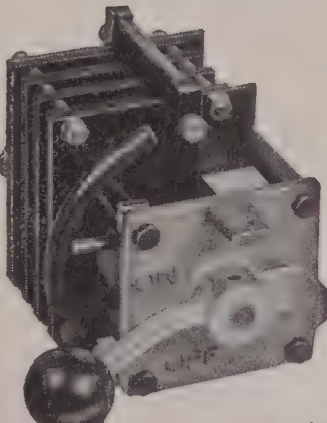

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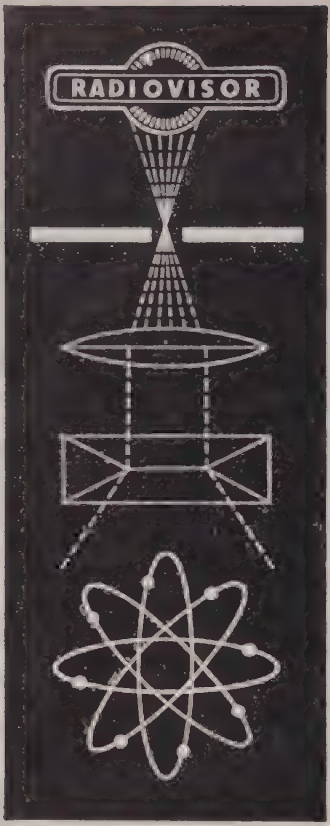

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Maintenance of level in hoppers, bunkers, vats and tanks is essential if production is to proceed without interruption. To meet the diverse requirements of industry Radiovisor produce a wide range of electronic level control equipments. They are specialists in this field with 30 years of practical experience to guide them.

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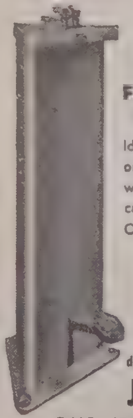

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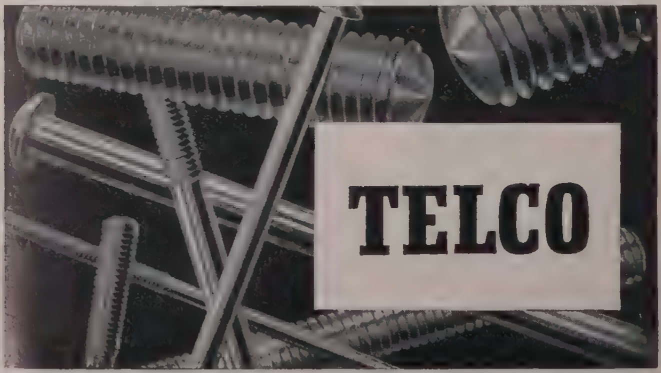

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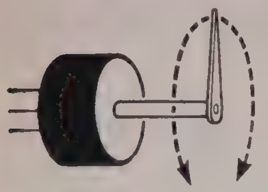
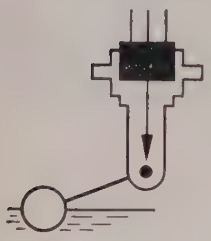
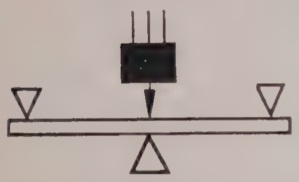


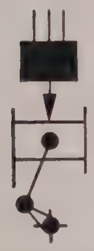
Angular Position



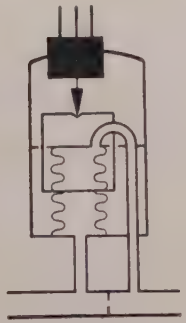
Fluid Level



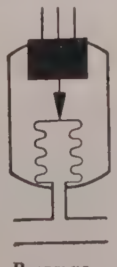
Force



Linear Position



Differential Pressure



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In terms of remote indication, the name SMITHS means a vast and comprehensive range of instruments of "stand-anything, go-anywhere" robustness.
For example:—

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is a simple, robust and extremely accurate method of transmitting to a remote observation point such functional information as Angular Position, Fluid Level, Force, Linear Position, Differential Pressure and Pressure.

- Operates from either 12 or 24 volt D.C. supplies
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- Two or three Indicators can operate from one Transmitter
- Single or Multi-Channel Recorders are also available for use with this system

A POINT WORTH NOTING
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A typical 4″ watertight square flange mounting 'Desynn' indicator with a novel form of prismatic illumination

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AP/415

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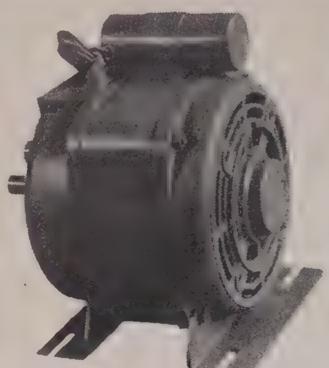
NORMACEM - PARVEX *of France*



The NORMACEM-PARVEX

2 Speed Single phase Motor

TYPE C.9.

This motor has been designed exclusively to eliminate the necessity of gear boxes and other complicated methods of transmission in fully automatic tumbler-action Washing Machines.

There are many innovations with this design, among them is the V-Belt drive which enables the drum to be driven in either direction. The lamination stack is 45 mm. It has a squirrel-cage rotor and the casing is die-cast aluminium.

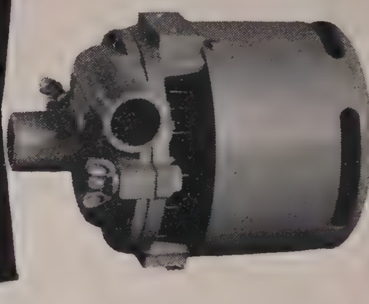
now present their new improved motors for household Washing Machines

★ **We have a wide range of fractional H.P. motors, also shaded pole motors for Spin Dryers.**

Fully descriptive literature is available on request

Sole Concessionaires for the United Kingdom

DAVID JACKSON (ENGINEERING) LTD.
11 Mauldeth Road, Withington
Manchester 20
Telephone: Rusholme 6124, 6802

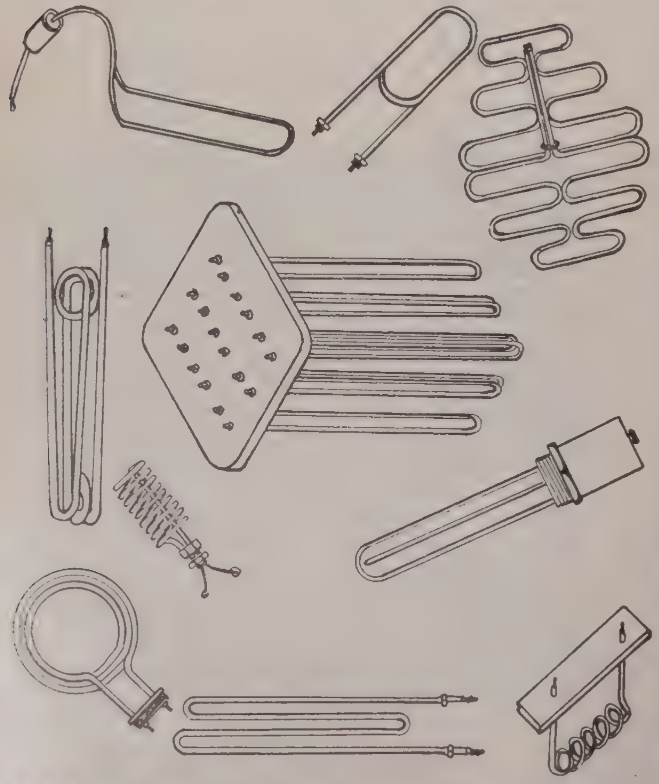


The NORMACEM-PARVEX

Motor Pump Unit

One of the main advantages of this unit is the special turbine designed to eliminate any blockage by small particles of laundry, buttons, etc. This removes the necessity of the housewife opening the filter normally built into standard motors, and so eliminates the impression that the Washing Machine is harsh on her laundry. It is strong, sturdy, reliable and easily mounted. There are more than 100,000 pumps in use at the moment.

ELTRON for ELEMENTS



ELTRON (London) LTD., Strathmore Road, Croydon

Telephone: Thornton Heath 1861

TRADE **TUNION** MARK

WALL BRACKETS

We offer you a wide selection of artistic plastic wall brackets designed to meet fully the present-day requirements for home furnishing and for commercial premises.

TMB/161

TMB/161. This E.S. Type is available either with or without pull switch and can also be supplied for exposed lamp.

TMB/158. This B.C. type takes a standard shade with 1⅛″ hole. It can be supplied with or without pull switch and also for inverted lamp to face upwards.

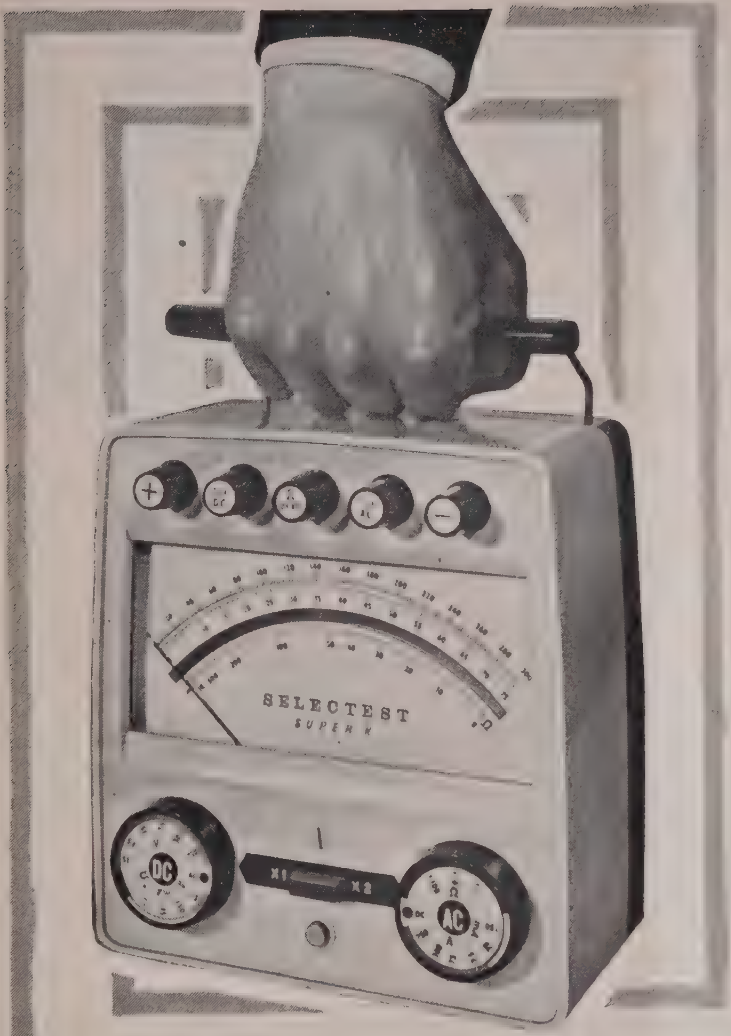
TMB/158

The above types can be supplied in BROWN. Both types available BC and ES.

Further types of wall brackets are detailed on page 20 of our 34 page illustrated Brochure 1453/ER and you are invited to apply for a copy. The Brochure also gives information of over 400 Tunion products.

GEORGE TURNOCK LTD

Tunion Works, Navigation Street, WALSALL, Staffs
Telephone: Walsall 4966



presenting
the most
advanced
MULTI-RANGE
TEST METERS
ever
designed...

Accurate readings can be taken with the instrument in any position. The resistors, rectifier, transformer, movement, switches and automatic cut-out are mounted on a robust printed circuit board, enclosed in a strong attractive, two-tone dustproof case, with a unique carrying handle.

Send for leaflet No. SK.50/6002/ER.

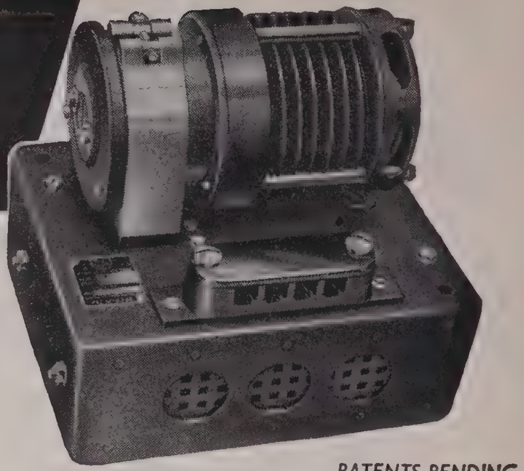
SEI

SELECTEST

SUPER K & SUPER 50

SALFORD ELECTRICAL INSTRUMENTS LTD.
PEEL WORKS, SILK STREET, SALFORD 3, LANCASHIRE. Tel: Blackfriars 6688
London Sales Office: Magnet House, Kingsway, W.C.2. Tel: Temple Bar 4668
A Subsidiary of THE GENERAL ELECTRIC CO. LTD. OF ENGLAND

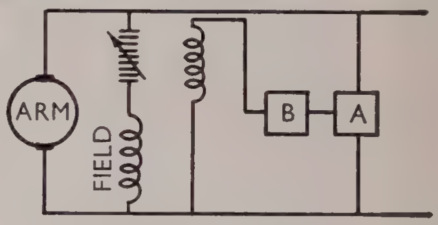
TRANSISTORISED AUTOMATIC VOLTAGE REGULATORS



PATENTS PENDING

Model shown is for the control of a 28 Volt D.C. generator for use on aircraft.

Regulation closer than ± 1% between extremes of temperature from −60°C to +70°C. Speed of response 50/60 milliseconds. For industrial purposes at normal ambient temperatures regulation within ± 0·5%. Dimensions 5″ x 6″ x 5½″ high. Weight 4lbs.



A=REFERENCE BRIDGE
B=TRANSISTOR AMPLIFIER

NEWTON DERBY

NEWTON BROS (DERBY) LTD
ALFRETON ROAD · DERBY
Phone: Derby 47676 (4 lines) *GRAMS: DYNAMO · DERBY*
London Office: IMPERIAL BUILDINGS, 56 KINGSWAY, W.C.2

MACLAREN

ACM-R THERMOSTAT

for controlling all forms of space heating in rooms and buildings

Particularly suitable for storage heating with block or floor heating, as it has no accelerator heater. The new design is of attractive appearance and the price has been reduced.

Suitable for loading up to 20 amps on 250 v. A.C.

We design and manufacture thermostats of all types.

Robert Maclaren & Co. Ltd.
EGLINTON WORKS · KILBIRNIE STREET · GLASGOW, C.5
Telephone: SOUTH 2011/2/3 *Telegrams: "SOCKET, GLASGOW"*

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words).

DISPLAYED CLASSIFIED:—48/- per single column inch.

Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

Advertisements are accepted up to **first post on Monday** of the week of issue

If displayed with boxed rules, name or symbol block by **Friday** prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF ILFORD

Street Lighting Group "B"
District Roads Scheme, Stage III

TENDERS are invited from experienced contractors for the following work in connection with this scheme:—

(a) Erection and connection of approximately 1,000 Columns.
(b) Cable laying, trenching and cable jointing.
(c) Thrust boring.

The thrust boring equipment will be supplied by the Council.

Conditions of contract and other documents may be inspected at the office of the Borough Engineer and Surveyor, Town Hall, Ilford, from whom the specification, bills of quantities and tender form may be obtained upon payment of £2 2s., which will be refunded on receipt of a bona fide tender, and all documents, not subsequently withdrawn.

Tenders in a plain sealed envelope bearing no name or mark indicating the tenderer and endorsed "Tenders for District Roads Lighting Scheme, Stage III," must be delivered to the Town Clerk, Town Hall, Ilford, not later than 4 p.m. on 26th July, 1960.

The Council do not bind themselves to accept the lowest or any tender. 4983

BOROUGH OF LLANELLY

Street Lighting Scheme 5

Connecting a Supply of Electricity to Street Lighting Columns

TENDERS are invited from competent contractors for the connecting of a supply of electricity from the South Wales Electricity Board's mains to approximately 245 Street Lighting Units in the Borough, and the excavating for and laying of approximately 750 lin. yards of cable in connection therewith.

Copies of the specification, bill of quantities and form of tender can be obtained from the Borough Engineer and Surveyor, Town Hall, Llanelly, on payment of a deposit of £2 2s. which will be refunded on receipt of a bona fide tender not subsequently withdrawn.

Tenders, in plain sealed envelopes endorsed, "Tender, Street Lighting Scheme 5," should be returned to the undersigned by not later than Thursday, the 30th June, 1960.

The Council does not bind itself to accept the lowest or any tender.

S. SAMUEL,
Town Clerk.

Town Hall,
Llanelly.
9th June, 1960. 4980

COUNTY BOROUGH OF HASTINGS

St. Paul's Primary School
Horntye Road, St. Leonards-on-Sea

ELECTRICAL contractors desirous of tendering for the electrical installation at the above are invited to submit their names to E. O. Baxter, M.Eng., A.M.I.C.E., Borough Engineer, 37, Wellington Square, Hastings, together with a deposit of three guineas (refundable on receipt of a bona fide tender) not later than 12 noon on Thursday, 7th July, 1960.

Tender documents will be forwarded to applicants immediately they become available.

N. P. LESTER,
Town Clerk.

Town Hall,
Hastings. 4967

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE

TENDERS are invited for the supply and erection of 8 points of 200-watt sodium vapour electric discharge overhead lighting on steel columns, complete with lanterns, lamps, leak transformers, capacitors and fuses, also for the re-erection of certain existing equipment required for the illumination of a roundabout to be constructed at the junction of the Doncaster By-Pass Motorway, with the Sheffield-Grimsby Trunk Road, A.630, at Warmsworth in the Doncaster Rural District.

Forms of tender and further particulars may be obtained from the County Engineer and Surveyor, County Hall, Wakefield.

The County Council do not bind themselves to accept the lowest or any tender.

Sealed tenders must be addressed to me, the undersigned, and received at Room 87, County Hall, Wakefield, not later than 12 noon on Monday, the 11th July, 1960.

BERNARD KENYON,
Clerk of the County Council.

County Hall,
Wakefield. 4982

INDIA STORE DEPARTMENT

THE Director-General of India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, invites tenders for the supply of:—

BILLET HEATING ELECTRIC FURNACES for ALUMINIUM ALLOY AND STEELS.

20014/60/HAL.2.
(1) Batch Type, 24" × 24" × 24", 0-600° C. 3
(2) Conveyor Type, 5′ 6" × 3′ × 16′, 0-600° C. 1
20015/60/HAL.2. Size 20" × 20" × 6", max. temp. 1,200° C. 1
16047/60/HAL.2. Vertical Type 3′ dia. × 6′ long, range 700° F. to 2,000° F. for heat treatment of steels 1

The tender forms with schedules and specifications, which are returnable on the 18th July, 1960, may be obtained from the above Office (C.D.N. Branch) on payment of a fee of ten shillings (not returnable) for each tender. Applications for forms should clearly state the tender reference numbers. 4955

CONSETT URBAN DISTRICT COUNCIL

Improved Street Lighting:
(i) Consett to Castleside Road (A.692)
(ii) Victoria Street, Bertha Street and Park Road (Road B.6322)

THE Council invite tenders from Electrical Contractors for the supply, delivery and erection of:—

(a) 10 Mercury Vapour, and
(b) 56 Sodium Vapour Lanterns,

together with all necessary fittings, poles, etc. This work to include for fixing and wiring.

Specification, form of tenders, etc., together with any further information required will be supplied on application to the Surveyor, Council Offices, Medomsley Road, Consett.

The closing date for receipt of priced tenders will be Tuesday, 5th July, 1960. The Council do not bind themselves to accept the lowest or any tender.

J. QUINN,
Clerk of the Council.

Council Offices,
Medomsley Road,
Consett.
13th June, 1960. 4939

FISHGUARD AND GOODWICK URBAN DISTRICT COUNCIL

Street Lighting: Trunk Road A.40

THE Council of the Urban District of Fishguard and Goodwick propose to install a scheme of Group "A" Lighting on the above Trunk Road within the Urban District, consisting of 19 140-watt enclosed Sodium Lanterns mounted at 25 ft. on Steel Columns, and 33 Brackets on existing wooden poles. Tenders are invited for the provision of the necessary Columns, Brackets, Lanterns, Lamps and ancillary Gear and Cabling, together with the Erection and Wiring.

Copies of the specification, conditions of contract, form of tender, etc., may be obtained from the Surveyor, Town Hall, Fishguard, on payment of a deposit of two guineas, which is returnable upon receipt of a bona fide tender not subsequently withdrawn and the return of the documents.

J. HYWEL EVANS,
Clerk of the Council.

Town Hall,
Fishguard. 4968

CITY AND COUNTY OF LICHFIELD

Group "A" Street Lighting, Walsall Road (A.461)

TENDERS are invited for the supply, erection and installation of 27 Steel Columns, together with Sodium Lanterns and all ancillary equipment.

Application for contract documents should be made to the City Engineer and Surveyor, Mr. D. Oglesby, M.I.Mun.E., Meredith House, 62, Wade Street, Lichfield.

Applications must be accompanied by a deposit of Two Guineas, which is returnable on receipt of a bona fide tender not subsequently withdrawn.

Tenders in a plain sealed envelope endorsed "Street Lighting A.461" must be received by the undersigned not later than noon on Friday, 8th July, 1960.

The City Council does not bind itself to accept the lowest or any tender.

HENRY J. CALLENDER,
Town Clerk.

Guildhall,
Lichfield.
7th June, 1960. 4938

INDIA STORE DEPARTMENT

THE Office of India Supply Mission, 2536, Massachusetts Avenue, N.W., Washington, 8, D.C., United States of America, invites tenders for the following:—

TENDER ENQUIRY NO. SE. 195
For the supply of Hot Line Tools and Accessories for E.H.T. Lines, Andhra Pradesh State Electricity Board.

Specifications, etc., relative to the above specification, can be obtained from the Co-ordination Branch, India Store Department, Bromyard Avenue, Acton, London, W.3, at a cost of 7s. 2d. per tender, and is not refundable. Tenders are to be returned direct to India Supply Mission, 2536, Massachusetts Avenue, N.W., Washington, 8, D.C., United States of America, so as to reach them by 9th August, 1960.

Specimen copy of the above enquiry can be seen at India Store Department, Engineering Branch, Bromyard Avenue, Acton, London, W.3, under the following reference, S.3133/60/NSC/ENG.2. 4981

***Official Notices** (continued)*

COUNTY BOROUGH OF CROYDON

Rewiring

TENDERS are invited for rewiring the electrical installation at the Whitehorse Manor School, Whitehorse Road.

Application should be made to the Borough Engineer, Town Hall, Croydon, for specification, drawings and tender form.

Closing date for tenders, 15th July, 1960.

E. TABERNER,
Town Clerk. 4940

SITUATIONS VACANT

(See "Replies to Box Numbers" on page 102)

SOUTH EASTERN ELECTRICITY BOARD

INSTALLATION INSPECTOR,
Central Sussex District.

Wages 5s. 6½d. per hour for 42-hour, 5-day week, under N.J.I.C. Agreement. Applicants should have sound knowledge of current regulations issued by the Institution of Electrical Engineers and be conversant with the Electricity Supply Regulations, in relation to consumers' installations. Superannuable.

The successful applicant will be based at Haywards Heath, but will be required to work anywhere in the District.

Applications, quoting ER and naming two referees, to District Manager, SEEBOARD, Electra House, Church Road, Haywards Heath, Sussex, by 4th July, 1960.

E.H.T. JOINTERS,
Herne Bay/Canterbury District.

Wages 5s. 1¾d. per hour for a 42-hour, 5-day week, under N.J.I.C. Agreement.

Applications, quoting ER and naming two referees, to the Joint District Managers, SEEBOARD, 65, Mortimer Street, Herne Bay, by 4th July, 1960.

ASSISTANT DISTRICT ENGINEER,
Worthing District.

Salary £860-£905 per annum. N.J.B. Class F, Grade 8. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to 33 kV. Rented housing accommodation may be available.

Applications, quoting ER and naming two referees, to District Manager, SEEBOARD, 56, Chapel Road, Worthing, by 6th July, 1960.

ASSISTANT DISTRICT ENGINEER,
Lewes District.

Salary £790 to £835 per annum under N.J.B. Class E, Grade 8. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to 33 kV.

Applications, quoting ER and naming two referees, to District Manager, SEEBOARD, 80/81, High Street, Lewes, Sussex, by 6th July, 1960.

ASSISTANT DISTRICT ENGINEER,
Weald District.

Salary £765 × £15 to £810 under N.J.B. Class E, Grade 9. Superannuable. The successful applicant will be required to assist in construction and maintenance of H.V. and L.V. overhead and underground mains and substations. Technical qualifications desirable.

Applications, quoting ER and naming two referees, to District Manager, SEEBOARD, Fairview, Highgate, Hawkhurst, Kent, by 6th July, 1960.

ASSISTANT DISTRICT ENGINEER,
Sevenoaks and Reigate District.

Salary £815 × £15 to £860 per annum under N.J.B. Class G, Grade 10, according to qualifications, experience and ability. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems, up to 11 kV. Suitable accommodation may be available and consideration will be given to a car allowance.

Applications, quoting ER and naming two referees, to District Manager, SEEBOARD, Electric House, West Hill, Oxted, Surrey, by 6th July, 1960.

ELECTRICAL FITTERS,
Hastings District.

Wages 5s. 1¾d. per hour for 42-hour, 5-day week under N.J.I.C. Agreement. The duties will include the erection, connection and maintenance of switchgear and transformers throughout the District. Superannuable.

Applications, quoting ER and naming two referees, on forms from District Manager, SEEBOARD, 12/13, York Buildings, Hastings, by 4th July, 1960.

ELECTRICAL FITTER,
Brighton and Hove District.

Wages 5s. 1¾d. per hour for 42-hour, 5-day week under N.J.I.C. Agreement. Experience in the erection and maintenance of H.V. and L.V. switchgear and transformers is essential. Contributory pension scheme optional.

Applications, quoting ER and naming two referees, to District Manager, SEEBOARD, Electric House, Castle Square, Brighton, 1, by 4th July, 1960.

FOURTH ASSISTANT ENGINEER
(Operation and Maintenance),
Surrey Sub-Area Headquarters, Dorking.

Salary £860-£905 p.a. in accordance with N.J.B. Class L, Grade 13. Superannuable. Applicants of at least H.N.C. standard should have had a sound training in electrical distribution. Duties will chiefly consist of assisting in plant maintenance and the testing and commissioning of system protection. A knowledge of, or interest in, the latter would be an advantage.

Applications, quoting ER and naming two referees, on forms from Surrey Manager, SEEBOARD, Rough Rew, Ridgeway Road, Dorking, Surrey, by 6th July, 1960.

ASSISTANT DISTRICT COMMERCIAL
ENGINEER, Woking District.

Salary under N.J.B. Class F, Grade 8, £860-£905 per annum. Superannuable. Applicants should be technically trained and be conversant with the commercial activities of a district. Initially the principal duties will be to control the work in connection with a large voltage standardisation programme.

Applications, quoting ER and naming two referees, on forms from District Manager, SEEBOARD, 4, Chobham Road, Woking, by 6th July, 1960.

GEORGE WRAY,
Secretary.
4993

'ENGLISH ELECTRIC'

PROFESSIONAL ENGINEERING APPOINTMENTS

are available with the Switchgear Organisation of this Group on a range of Application and Contract Engineering duties.

Experience in manufacture, power generation and supply or in the utilisation of electricity is sought, and professional engineers are invited to apply for consideration.

A number of vacancies also exist for younger engineers with Higher National Certificate in Electrical Engineering, and preferably having served an engineering apprenticeship, which offer opportunity for acquiring experience, scope for advancement and training as professional engineers.

All appointments are pensionable after a qualifying period.

Apply stating age, experience and qualifications to :—

DEPT. G.P.S., 336/7, STRAND, LONDON, W.C.2

quoting reference ER497F

4961

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Chief Engineer's Department

THIRD ASSISTANT ENGINEER,
Technical Section, Carliol House.

Applicants should have had experience in testing, commissioning and maintenance of electrical measuring instruments and protective equipment. Knowledge of the design of electronic devices and circuits will be an advantage.

Salary Schedule B, Grade 5 or 6 according to qualifications, £925/£1,320. N.J.B. conditions of service.

Two SENIOR DRAUGHTSMEN at Carliol House.

Applicants should have experience in preparation of schematic and electrical layout drawings for proposed 132-kV substations, and the preparation of route plans for 132-kV overhead lines. Knowledge of building construction would be an advantage. Candidates should be neat and capable draughtsmen and possess an O.N.C. in Electrical Engineering or equivalent qualification.

Salary Schedule D, Grade 5, £790/£890.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 5001

ELECTRICAL DESIGNER

ESSO PETROLEUM COMPANY LTD. have a vacancy at their new refinery now under construction at MILFORD HAVEN in PEMBROKESHIRE, SOUTH WEST WALES, for an ELECTRICAL DESIGNER.

The person appointed will be responsible for designing and drafting refinery power distribution networks up to 11 kV and for developing protection systems for the refinery power supply. He will also be responsible for lighting and instrumentation layouts, and for testing procedures.

Applications are invited from men with Higher National Certificate or an equivalent qualification, and who have had experience of flameproof equipment and of electrical installation in hazardous areas.

The commencing salary will depend on experience, qualifications and age. The company also offers membership of a comprehensive pension plan.

Applications giving full details of experience, age, qualifications and present salary will be treated in strict confidence and should be addressed to :—

The Employee Relations Superintendent
(Ref. CJ.7)
ESSO PETROLEUM COMPANY LTD.
Esso Refinery
P.O. Box 11, Milford Haven, Wales
4936

NO FUTURE IN YOUR PRESENT POSITION?

An open letter to ENGINEERS, TECHNICIANS & DRAUGHTSMEN

YOU have probably seen our recent advertisements recruiting men of your profession to join our Research, Development and Production teams. We have begun an expansion programme covering the new and interesting applications of control equipment which current technological advances demand.

WE still require applicants for the following pensionable positions carrying good salaries, excellent prospects and the security of working with a world renowned organisation.

CONTROL GEAR ENGINEERS
Engineers and Technicians who are already engaged in the maintenance or application of electrical control gear for use in heavy industries. Qualifications: H.N.C. or practical equivalent.

CIRCUIT ENGINEERS
We require adaptable and imaginative men with electrical training to O.N.C. standard (or its practical equivalent). Experience of our equipment would be an advantage but we are prepared to train suitable applicants.

LIFT CIRCUIT ENGINEERS
Engineers with practical experience in the Lift industry. O.N.C. or equivalent qualifications.

In addition we have attractive positions to offer the following:

DESIGN DRAUGHTSMEN, DETAIL DRAUGHTSMEN, ENGINEERING ESTIMATORS, JUNIOR STANDARDS ENGINEERS, TRAINEE CONTRACTS ENGINEER
(O.N.C. or equivalent).

If you are in a dead end job — or even if you aren't, give me a ring or drop me a line to fix an appointment.
I look forward to meeting you

D. C. BRIDLE, PERSONNEL OFFICER

DEWHURST & Partner Limited
INVERNESS ROAD, HOUNSLOW
Tel.: HOU 7791

239

ENGINEERING DESIGNER-DRAUGHTSMEN

AIR MINISTRY Works Designs Branch requires in LONDON and PROVINCES ENGINEERING DESIGNER-DRAUGHTSMEN experienced in preparation of schemes for illumination and electrical equipment of buildings or schemes for H.V. and M.V. electrical distribution.

Candidates should have served recognised apprenticeship or had equivalent training and also have had practical experience. O.N.C. an advantage. Financial assistance and time off given for recognised courses of study. Promotion and pension prospects. 5-day week with 18 days' paid leave per year initially. Overseas tours for which special allowances granted.

Salary in LONDON ranges from £680 (at age 25) to £900 p.a. for men; from £673 to £868 for women. Somewhat lower in PROVINCES. Commencing salary dependent on age, qualifications and experience.

Applicants, who must be natural-born British subjects, should write to Air Ministry, W.G.d, Lacon House, Theobalds Road, London, W.C.1, or apply to any Employment Exchange quoting Kings Cross 896, giving age, details of training, qualifications, full particulars of former posts held and copies of any testimonials. Candidates selected will normally be interviewed in London and certain expenses reimbursed. 252

BRITISH TRANSPORT COMMISSION

require in the department of the Chief Electrical Engineer, Melbury Terrace, Marylebone, London, N.W.1, a QUALIFIED ENGINEER to assist in the specification and design of the overhead line contact system, including supports and ancillary equipment, for A.C. railway electrification. Experience in design and installation of the catenary system particularly desirable.

Salary range £1,095-£1,210.

Superannuation scheme, certain travel facilities, medical examination.

Write stating age, qualifications and experience to the Director of Establishment, British Transport Commission, 222, Marylebone Road, London, N.W.1, within 14 days. 4932

COUNTY BOROUGH OF CROYDON EDUCATION COMMITTEE

invites applications from suitably qualified teachers for the following posts which will become tenable in September:—

Croydon Technical College, Fairfield, Croydon
Principal:
D. A. Green, M.B.E., B.Sc., M.Ed.

ASSISTANTS GRADE B for the Department of Electrical Engineering. The subjects required are Mathematics, Electrical Installation Work and Radio Television and Electronic Servicing, and applicants are asked to say which of these they offer.

The salaries for the posts are in accordance with the Burnham Technical Scale of £700-£1,150 per annum plus London area allowance, with appropriate allowances and increments for degree, training and previous teaching and industrial experience.

Further particulars and forms of application may be obtained from the Chief Education Officer, Education Office, Katharine Street, Croydon, and should be returned to the Principal within 14 days of the appearance of this advertisement. 4935

ELECTRICAL INSULATION

A FIRM with first-class connections in this field and with good production facilities is expanding and will be glad to consider applications from those with a full knowledge of any branch of the trade with a view to creating new sections, under control of successful applicants.

This is a fine opportunity for progressive men who feel that they lack opportunity in their present positions. Good salaries and conditions of service including pension scheme will be offered.

Write in full confidence to Managing Director, Box Z.J.68, Deacons Advertising, 36, Leadenhall St., London, E.C.3. 4943

SOUTH WALES ELECTRICITY BOARD

Assistant Engineer

APPLICATIONS are invited for the position of ASSISTANT ENGINEER in the Mid-Wales and North Monmouthshire District (Brecon) in the Monmouthshire and Mid-Wales Area of the Board.

The successful applicant will be employed on planning, operational and constructional duties within this extensive rural district of 1,180 square miles, and will obtain considerable experience in the development of a rural supply network.

The salary for the position will be in accordance with Class E, Grade 9 (£765/£810) of the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to D. G. Gwyn, B.Sc., A.M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Albany Chambers, Skinner Street, Newport, Mon., so as to arrive not later than Saturday, 9th July, 1960.

Envelopes should be endorsed "Assistant Engineer, 69/60."

R. G. WILLIAMS,
Secretary. 4934

OVERSEAS CONTRACTS ENGINEER

A VACANCY exists for an experienced Electrical Engineer to take charge of installation and commissioning of cables, overhead lines, switchgear and transformers with associated administrative work. Previous supervisory experience essential. The work would be located in Nigeria and Ghana, the initial period of this tour being 18 months.

Applications giving full particulars of age, training and experience to:—

Employment Manager
JOHNSON AND PHILLIPS LIMITED
Victoria Way, Charlton, London, S.E.7

4971

Situations Vacant (continued)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Birmingham and District Sub-Area

SECOND, THIRD and FOURTH ASSISTANT ENGINEER (Technical and Planning Section) (Headquarters).

Suitably qualified engineers are required for the above posts, to be responsible for, and to assist with, analysis of loading conditions, design of extensions and reinforcements to the H.V. and M.V. systems, mainly underground, and layout and specifications of plant and equipment. The City of Birmingham is presently being extensively redeveloped and the work will be interesting and varied. The Board operates a management development scheme and offers good prospects of advancement to suitable staff. Salaries will be according to qualifications and experience, within the following ranges:—

Second Assistant Engineer, £1,270/£1,360 or £1,360/£1,450 per annum (N.J.B. Grades M. 8 or 7).

Third Assistant Engineer, £1,025/£1,085, £1,095/£1,170 or £1,195/£1,270 per annnum (N.J.B. Grades M. 11, 10 or 9).

Fourth Assistant Engineer, £910/£955 or £965/£1,025 per annum (N.J.B. Grades M. 13 or 12).

Apply by letter stating age, education, experience, present position and salary to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

Central Gloucestershire Sub-Area

THIRD ASSISTANT ENGINEERS (Control) (two) (Headquarters).

The successful applicants will be required to take full shift responsibilities for all functions associated with high voltage system control. Applicants should have had sound technical training together with experience of switching operations and maintenance work on H.V. distribution equipment. Technical qualifications desirable. Salary £965/£1,025 per annum (N.J.B. Grade K. 10), plus 10% shift enhancement.

Apply by letter within 14 days, stating age, experience and qualifications, present position and salary, to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

Worcester and District Sub-Area

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (Redditch/Bromsgrove).

Applicants should have had a sound technical training and wide practical experience in estimating and contracting work. A good knowledge of electrical installation practice is required. The successful applicant will be required to assist in all branches of commercial work, including advising consumers on domestic, commercial and industrial equipment, and rural development. Salary £860/£905 per annum (N.J.B. Grade F. 8). (It is expected that there will be a change in classification to Class G as from 1st April, 1960.)

Apply by letter within 14 days, stating age, experience, present position and salary, to District Manager, Midlands Electricity Board, Windsor Road, Redditch.

F. W. CATER,
Secretary.
4986

REPRESENTATIVE

to cover London and Southern Counties for leading manufacturers of distribution equipment and accessories.

The appointment calls for a first-class man of education with personality and able to pursue the company's interests at high level with Area Electricity Boards, consultants and contractors. Electrical background desirable though not essential. Age 25/35.

Remuneration by salary with car and full expenses. Holiday arrangements honoured.

Write with brief but full details of career, to—Box 5006.

INSTRUMENT TECHNICIANS

required at

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

for the following appointments :—

INSTRUMENT REPAIR SHOP FOREMAN (Ref. 1714/48) to be responsible for the organisation and control of an Instrument Repair Workshop.

INSTRUMENT TEST, CALIBRATION AND COMMISSIONING (Ref. 1715/48) of a wide range of industrial and laboratory indicating and recording instruments, both physical and electrical, and process control equipment.

INSTRUMENT SCHEDULED MAINTENANCE SERVICE (Ref. 1723/48) to be responsible for the operation of this service for INSTRUMENTS and PROCESS CONTROL GEAR on plant and experimental equipment and for the investigation of faults.

Applicants should have served a recognised engineering apprenticeship or have had equivalent training and have had practical experience in overhauling and calibrating instruments referred to in Ref. 1715/48. The ability to supervise and instruct craftsmen in the overhaul of these instruments is required for Ref. 1714/48.

Experience of electronic instruments and possession of O.N.C. in Electrical Engineering is desirable.

SALARY £925 (at age 30 or over) to £1,105 p.a.

Housing and superannuation schemes.

Send POSTCARD for details to Personnel Manager (quoting appropriate reference), U.K.A.E.A., A.E.R.E., Harwell, Didcot, Berks.

4930

YORKSHIRE ELECTRICITY BOARD

No. 1 (Bradford) Sub-Area

SUB-AREA SECRETARY.

Applicants should have had wide administrative experience in a senior appointment in the electricity supply industry. Membership of an appropriate professional body will be an advantage.

Salary N.J.M. and H.E. Class C, Scale 5, £1,940/£2,140 per annum.

Applications giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford, not later than 8th July, 1960.

No. 4 (Leeds) Sub-Area

SENIOR DRAUGHTSMAN (Civil).

Applicants should have had a recognised technical training and have had experience in the design and detailing of new buildings and in the conversion of existing buildings.

Experience in the preparation of bills of quantities and estimates is essential and the ability to design simple reinforced concrete and/or steel structures would be an advantage.

Salary N.J.B. Schedule D, Grade 5, £790/£20/£890 per annum.

Applcations giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, nr. Leeds, not later than 8th July, 1960.

No. 3 (Sheffield) Sub-Area

SHEFFIELD DISTRICT
SENIOR SALES REPRESENTATIVE.

Applicants should have had previous sales experience in the electricity supply industry and should be competent to control representatives engaged on matters connected with supply, tariffs, apparatus, and sales to domestic, small commercial and industrial consumers. The possession of the E.D.A. Salesmanship Diploma will be an advantage.

The successful applicant will be based on Sheffield, but will be required to work throughout the Sub-Area, as occasion demands; in addition, he may be required to undertake duties in the service centre.

Salary N.J.C. Grade 3, £720/£20/£780 per annum.

Applications giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, 1, not later than 8th July, 1960. 4992

SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

Regional Engineer's Department

APPLICATIONS are invited for appointments on the permanent staff of the Board generally in acordance with the Whitley Council conditions of service.

The Board is undertaking a considerable programme of hospital development and the persons appointed will be engaged on varied and interesting work.

ENGINEERING GENERAL GRADE.

Applicants should be (i) Corporate Members of the Institution of Electrical Engineers or (ii) have passed the Institution's examination, and be Graduate Members, and be experenced in the preparation of specifications, drawings and estimates for electrical installations in hospitals and large public buildings.

Salary scale on or after 1st July, 1960, £910 × £35 (1) × £40 (2) × £45 (5) × £50 (7) to £1,600. Bar at £1,205 for Graduate Members of the Institution. Corporate Members will commence at £1,160 p.a. London Weighting allowance of £40-£50 p.a. payable in addition.

Applications stating age, qualifications, experience, present appointment and salary, together with the names and addresses of three referees, should be sent to the undersigned at 40, Eastbourne Terrace, London, W.2, by not later than 9th July.

E. G. BRAITHWAITE,
Secretary.
4985

'ENGLISH ELECTRIC'

FUSEGEAR DIVISION

who manufacture a wide range of switchboards and distribution equipment incorporating H.R.C. fuses, have a limited number of vacancies for experienced

SALES AND CONTRACTS ENGINEERS

at their Liverpool Works. These appointments command a good salary, are permanent and pensionable with life assurance benefits after a short qualifying period. There are excellent opportunities for promotion and advancement for keen young electrical engineers interested in making a career with the Company.

Outside Technical Representatives for both Home and Overseas territories are appointed from the inside Engineering staff from time to time, after completion of an initial period in the Works.

Qualifications required are H.N.C. or equivalent, together with sound practical training and experience in (a) industry, (b) electrical contracting or (c) electricity supply. Applications will also be considered from more junior engineers who are at present in the final year of study for the H.N.C. in Electrical Engineering but who do not have commercial experience. In such cases training will be given. Generous assistance with removal and housing expenses will be given to successful candidates. Please write giving full details of qualifications and experience to:

DEPT. G.P.S., MARCONI HOUSE, STRAND, LONDON, W.C.2

quoting reference ER 497E

282

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

Croydon "B" Power Station

ASSISTANT SHIFT CHARGE ENGINEER (Vacancy No. 135/60). Candidates for this position should have had a sound practical training, be experienced in the operation of modern power station plant, and preferably have undertaken technical training to Higher National Certificate level.

Salary within N.J.B. Class J, Grade 9, £1,111 10s. to £1,177 10s. per annum, including shift and London allowances.

Applications, giving age, details of experience, qualifications, etc., should be sent to the Station Superintendent, Croydon "B" Generating Station, Beddington Farm Road, Croydon, Surrey, to arrive by 30th June, 1960.

W. H. DUNKLEY,
Divisional Controller.

4957

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

ENGINEERING DRAUGHTSMAN required in the Electrical Engineer's Drawing Office at Divisional Headquarters, Birmingham.

Applicants should have suitable technical training and be capable, under supervision, of preparing detail drawings in connection with the construction of high-voltage substations.

Salary will be in accordance with Grade 6 of Schedule D of the National Joint Board Agreement, within the range £620 to £740 per annum.

Applications, quoting Vacancy No. 144/60MD, should be submitted on the official form AE6, which may be obtained from the Establishments Officer, Central Electricity Generating Board, Midlands Division, 53, Wake Green Road, Moseley, Birmingham, 13. Closing date for receipt of applications, 1st July, 1960. 4958

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

ASSISTANT ENGINEER (Operation),
STEPNEY POWER STATION
(Vacancy No. 60/447).

Sound technical training with experience of power station plant operation, preferably P.F. fired. Duties include relief for other N.J.B. shift staff. Salary Class F, Grade 9 = £865 plus £90 shift per annum.

Applications, quoting vacancy number, to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 4th July, 1960.

4959

***Situations Vacant** (continued)*

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Area Headquarters

WHERSTEAD, IPSWICH
SENIOR ASSISTANT ENGINEER
(Commercial)
(154/60.R.).

Applications are invited for the above appointment in the Tariffs and Economics Section of the Chief Commercial Officer's Department.

Candidates should have a knowledge of the economics of the electricity supply industry and should have wide general experience of electricity tariffs. Experience in the preparation and negotiation of terms for supplies to industrial consumers is desirable, as is a knowledge of statistical methods. Appropriate engineering or economic qualifications would be an advantage.

Salary, at present, N.J.B. Class AX/EX, Grade 3 (£1,365-£1,630). From 1st July, 1960 the salary range will be £1,365-£1,730).

Apply by letter to the Chief Commercial Officer, Eastern Electricity Board, P.O. Box 40, Wherstead, Ipswich, Suffolk, by 8th July, 1960.

Norfolk Sub-Area

KING'S LYNN AND WESTERN DISTRICT
SECOND ASSISTANT ENGINEER
(155/60.R.).

Applicants should have had a sound technical training and considerable experience in the construction, operation and maintenance of overhead and underground distribution systems (including substations) at voltages up to and including 33 kV.

Salary N.J.B. Class F, Grade 7 (£910-£955).

Apply by letter to the Manager, King's Lynn and Western District, Eastern Electricity Board, Gaywood Bridge, Wootton Road, King's Lynn, by 8th July, 1960.

Northmet Sub-Area

SUB-AREA HEADQUARTERS
SOUTHGATE, LONDON, N.14
GENERAL ASSISTANT
DEVELOPMENT SECTION
(Ref. 983) (151/60.R.).

Candidates should have had a good general and technical education and possess the Higher National Certificate or equivalent qualifications. Previous experience in planning and development work will be an advantage.

Salary N.J.B. Grade 18/14, within the range of £750-£1,005 inclusive of London allowance, the grade to be dependent upon qualifications and experience.

Apply by letter to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, by 4th July, 1960.

HORNSEY DISTRICT
FOURTH ASSISTANT ENGINEER
(Ref. 950) (152/60.R.).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class G, Grade 11 (£765-£810) plus London allowance.

Apply by letter to C. Bradley, M.I.E.E., Manager, Hornsey District, Eastern Electricity Board, The Broadway, Crouch End, Hornsey, London, N.8, by 4th July, 1960. 4987

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE

Burton Street, Nottingham

Principal:
D. A. R. Clark, M.Sc.(Tech.), M.I.Mech.E.

APPLICATIONS are invited for the vacancy of:—

ASSISTANT LECTURER GRADE B in
ELECTRICAL ENGINEERING.

Salary in accordance with the Burnham Technical Scale, £700 × £27 10s. to £1,150 per annum, plus additions for qualifications and training. Commencing salary according to previous experience.

Research encouraged. Facilities and equipment available.

Further particulars and form of application may be obtained from the Principal, to whom completed forms should be returned not later than 8th July, 1960. 4984

M.K. ELECTRIC LIMITED

have the following vacancies in their Technical Drawing Office.

DESIGNERS—experienced in the design of small Electrical/Mechanical products for large-quantity manufacture.

DRAUGHTSMEN—with routine Drawing Office experience and preferably in connection with small Electrical products—preparing standard drawings, data sheets, etc.

PHOTO-PRINTING—an assistant (male or female) for the photo-printing and photographic section with previous photo-printing experience and a knowledge of industrial photography.

Excellent working conditions in a new Drawing Office. Five-day week of 37½ hours. Holiday arrangements honoured and attractive salaries offered according to experience.

Applications treated in strict confidence if addressed to:—

Technical Manager

M.K. ELECTRIC LIMITED

Shrubbery Road, Edmonton, London, N.9

4841

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Maintenance and Operation)

Heston District of No. 1 (Southall) Sub-Area. Salary N.J.B. Class G, Grade 9 (£910-£955 per annum, inclusive of London allowance). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of switchgear, transformers, auxiliary gear and underground cables up to and including 11 kV. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, quoting Z.1197, not later than 4th July, 1960.

Assistant Engineer (Maintenance and Operation)

Portsmouth District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class H, Grade 9 (£910-£955 per annum), with N.J.B. conditions of service, but present trends indicate that the District may be reclassified to Class J with effect from 1st April, 1960 (£965-£1,025 per annum).

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1212, not later than 4th July, 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 4999

GOVERNMENT OF HONG KONG

Electrical/Mechanical Engineer, Public Works Department

DUTIES comprise the design, estimation, installation, operation and maintenance of air conditioning installations in large buildings including refrigeration plant.

Permanent and pensionable appointment. Salary according to experience within the range £1,650-£2,865. Quarters at low rent. Free passages. Generous leave.

Candidates must be under 35 years and A.M.I.E.E. or A.M.I.Mech.E. with at least three years' post qualification experience in the refrigeration industry.

Write Director of Recruitment, Colonial Office, London, S.W.1, giving full names, age, qualifications and experience, quoting BCD 112/51/033/D11. 4989

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointments in the Divisional Electrical Department:—

FOURTH ASSISTANT ENGINEER,
FINCHLEY (West) TECHNICAL
SECTION (S.V. No. 1332).

Salary N.J.B. Class AX/DX, Grade 8, £775 × £25 to £910/£985 per annum inclusive of London weighting.

Previous experience in the commissioning of high voltage electrical apparatus and associated protective gear would be an advantage.

Applicants should possess a Higher National Certificate in Electrical Engineering or its equivalent.

The applicant appointed will be required to reside in the Barnet-Watford-Harrow area.

THIRD ASSISTANT ENGINEER
(Civil and Mechanical),
DIVISIONAL HEADQUARTERS
(Cockfosters, North London)
(S.V. No. 1359).

Salary N.J.B. Class AX/DX, Grade 6, £975 × £25 to £1,100/£1,190 per annum inclusive of London weighting.

The successful applicant will be required to assist in the supervision of contracts for the installation of overhead lines constructed on steel towers and for foundations and site works for transmission substations, and should have received the appropriate training for such duties.

Applications, quoting the appropriate Reference S.V. Number, stating age, qualifications, experience and present position should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 2nd July, 1960. 4970

DEMERARA ELECTRIC COMPANY LTD.

Georgetown

A VACANCY occurs for an ASSISTANT ELECTRICAL SUPERINTENDENT, preferably with H.N.C. qualification. The company is expanding and candidates should have good experience of an Undertaking's general work, particularly in respect of distribution, construction and switchgear.

Starting salary about £1,500 per annum.

Please forward full particulars to: Messrs. Mackness & Shipley, Consulting Engineers, Parliament Mansions, Abbey Orchard Street, London, S.W.1, quoting reference 2481. 4994

LANCASHIRE DYNAMO NEVELIN LTD.

Hurst Green, Oxted, Surrey

APPLICATIONS are invited for vacancies which exist in the following categories :—

SALES ESTIMATOR

Estimator to handle enquiries and quotations for medium-voltage switchgear and motor control gear.

ENGINEERS

Contract design engineers with previous experience of medium-voltage switchgear, motor control gear, silicon and selenium rectifiers. Minimum qualifications H.N.C. Electrical or equivalent.

DRAUGHTSMEN

Senior and Intermediate Draughtsmen for design and development of power rectifiers, medium-voltage switchgear and motor control gear.

Applications in writing to Personnel Manager, giving full details of age, experience and qualifications.

4869

SOUTH OF SCOTLAND ELECTRICITY BOARD

Edinburgh and Borders Area

Installation Engineer, Edinburgh East District (Salary N.J.B. Schedule A, Class G, Grade 9, £860/£905 per annum)

APPLICATIONS are invited for the appointment of an INSTALLATION ENGINEER in the Edinburgh East District and should be submitted to the undersigned not later than 8th July, 1960.

Applicants should have a good knowledge of the organisation and operation of a contracting department, including estimating and costing, and be familiar with domestic, commercial and industrial installation work. Applicants should possess the minimum qualification of Ordinary National Certificate in Electrical Engineering.

Conditions of service are in accordance with the National Joint Board Agreement for the Electricity Supply Industry, and the successful candidate, subject to satisfactory evidence of health, will require to become a contributor to the Board's superannuation scheme.

C. H. A. COLLYNS,
Manager.

52, Melville Street,
Edinburgh, 1.
7th June, 1960.

4933

SMITHS AVIATION DIVISION

at CHELTENHAM, GLOS.

require a

DEVELOPMENT ENGINEER

to work on the design and development of miniature precision A.C. motors and synchros for servo-mechanisms.

Applicants should possess a Degree of H.N.C. in Electrical Engineering or equivalent. A good theoretical background and development experience on A.C. machines is required.

Write giving full particulars of age, previous experience, qualifications, present salary and salary envisaged to the

Divisional Personnel Manager

S. SMITH & SONS (ENGLAND) LIMITED
Bishops Cleeve
Nr. Cheltenham, Glos

4929

EAST MIDLANDS ELECTRICITY BOARD

Northamptonshire Sub-Area

APPLICATIONS are invited from suitably qualified persons for the following appointments:—

FOURTH ASSISTANT ENGINEER
(Shift Operations)
(Vacancy No. 79/60).

Salary N.J.B. Class K, Grade 12, £860 × £15 to £905 per annum, plus shift allowance.

Candidates should have had experience of switching operations on a high voltage distribution system, preferably including both urban and rural networks. Experience in the issue and cancellation of permits to work under the C.E. Safety Rules, or acting as Control Engineer for part of a high voltage system, would be an advantage.

Applications giving details of experience, etc., should be addressed to the Manager, Northamptonshire Sub-Area, 25, Bridge Street, Northampton, within fourteen days of the date of this advertisement.

KETTERING DISTRICT

JOINTER (Extra High Tension).
FITTER (Electrical).

Present rate of pay 5s. 1¾d. per hour. N.J.I.C. conditions. 42-hour, 5-day week. Holiday, sick pay and optional superannuation scheme.

Applications should be sent to the District Engineer, Kettering District, Rockingham Road, Kettering, Northants., within fourteen days of the date of this advertisement.

4998

LEEDS COLLEGE OF TECHNOLOGY

Calverley Street, Leeds, 1

Principal: C. Chew, M.Sc.Tech., F.R.I.C.

APPLICATIONS are invited for the following posts, duties to commence on the 1st September next, or as soon as possible thereafter :—

(a) SENIOR LECTURER IN ELECTRICAL ENGINEERING. Applicants should hold a good degree in the subject with industrial or research experience in Electronics and Telecommunications.

(b) LECTURER IN ELECTRICAL ENGINEERING. Applicants should possess a good degree or equivalent qualifications in the subject together with industrial or research experience.

Burnham Technical Salary Scales :—

Senior Lecturer ... £1,550-£50-£1,750
Lecturer ... ... £1,370-£35-£1,550

Allowance for experience of comparable responsibility may be made in the commencing salary.

Further particulars and form of applications, to be returned as quickly as possible, may be obtained by sending a stamped addressed foolscap envelope to the Principal of the College.

GEORGE TAYLOR,
Chief Education Officer.

Education Dept.,
Calverley Street,
Leeds, 1.

4931

NORTH WESTERN ELECTRICITY BOARD

Principal Assistant (Commercial)
Sub-Area Commercial Department
Manchester

Duties include assisting in the general organisation of sales activities in the Sub-Area, particularly relating to domestic and commercial consumers. Applicants should have had a wide experience in the organisation and supervision of service centres; planning sales campaigns; preparation of staff training lectures; interior and window displays and exhibition layouts; preparation and giving of lecture demonstrations to outside organisations; and dealing with all types of correspondence from domestic and commercial consumers. Technical knowledge of appliances and installations will be an advantage.

Salary scale £1,070 × £30 to £1,160 p.a. Grade 7, N.J.C. conditions.

Application forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, 2, P.O. Box 493, and returned to him by 6th July, 1960.

Draughtsman (Electrical), Sub-Area Engineering Department, Oldham

Applicants should have had a sound drawing office experience and a good technical education.

Salary scale £640/£725 p.a. Grade L.18, N.J.B. conditions.

Application forms to be obtained from the Manager, No. 3 Sub-Area, North Western Electricity Board, Union Street, Oldham, and returned to him by 9th July, 1960.

5003

LONDON ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the above position in the Ravensbourne District, Sydenham, London, S.E.26.

Candidates should have a good general and technical education and be in possession of the Ordinary National Certificate, be neat and capable draughtsmen and be experienced in one or more of the following subjects: drawing office routine, electrical diagrams, lay-out of plant in transformer chambers, mains survey and recording of mains work.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6 (£660 to £780 per annum), inclusive of London allowance.

Application form obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned within fourteen days of the publication date of this advertisement. Please quote ref PER/V/2996/R.

4995

CAMERON HIGHLANDS HYDRO-ELECTRIC SCHEME MALAYA

REQUIRED by Consulting Engineers for site construction staff, an Engineer with experience of foundations for light structures in difficult ground, and preferably with some experience of overhead transmission line construction. The work would be almost entirely in the field and applicants should be corporate members of one of the senior institutions, preferably the Institution of Civil Engineers. Two-year tour. Passages provided.

Candidates should be single, although those who are married and prepared to complete the tour without their family will be considered. Concessionary housing, free medical attention and transport allowance. Salary not less than £3,290 per annum.

Applications should be made in writing within 14 days of the publication of this advertisement, giving full details of previous experience to:—

PREECE, CARDEW & RIDER
8, 10 & 12, Queen Anne's Gate
London, S.W.1

4960

Situations Vacant *(continued)*

NORTH EASTERN ELECTRICITY BOARD

Chief Commercial Officer's Department

APPLICATIONS are invited for a COMMERCIAL STAFF TRAINER in the Chief Commercial Officer's Department at Area Board Headquarters, Newcastle upon Tyne.

Applicants should have considerable electricity service centre experience or a wide experience in sales training and have the ability to instruct. The person appointed will be expected to assist in the administrative arrangements and development of sales training courses and to give instruction in sales technique to Board's employees attending basic courses in sales training and to employees attending more specialised courses on different types of appliances. The possession of O.N.C. in Electrical Engineering or a City and Guilds Installation Certificate would be an advantage. The salary will be on Grade 7, N.J.C. (£1,070-£1,160) or Grade 6, AX1/DX, Schedule B, N.J.B. Agreement (£925-£1,140) according to qualifications and experience.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 5002

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments:—

LLYNFI POWER STATION
NR. BRIDGEND, GLAM
ASSISTANT SHIFT CHARGE ENGINEER
(Vacancy No. 159/ER/60).

Salary G.9, £860-£905 per annum, plus 10% shift enhancement.

UPPER BOAT POWER STATION
PONTYPRIDD, GLAM
SHIFT CHARGE ENGINEER
(Vacancy No. 160/ER/60).

Salary H.7, £1,025-£1,085 per annum, plus 10% shift enhancement.

Applicants should possess H.N.C. or equivalent and should have had operating experience in a power station.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 8th July, 1960. 4988

THE POLYTECHNIC

309, Regent Street, London, W.1

DEPARTMENT OF ELECTRICAL ENGINEERING

APPLICATIONS are invited for the post of LECTURER in Electrical Engineering, duties to begin on 1st September, 1960. Candidates should be qualified both academically and by industrial experience to lecture on general electrical technology and electrical power engineering to B.Sc.(Eng.) and Diploma in Technology students.

The salary scale commences at £1,370, rising by annual increments of £35 to a maximum of £1,550, plus London allowance of £38 or £51, per annum.

A form of application, which should be returned not later than 8th July, may be obtained from the undersigned.

J. E. RICHARDSON,
Director of Education.
4991

WAR DEPARTMENT EMPLOYMENT

A VACANCY exists in the Salisbury Plain S.W.S. Troop, Royal Signals, Bulford Camp, for a FOREMAN OF SIGNALS (Tech. III post).

Qualifications required: City and Guilds Telecommunications (Principals) II and Telephone Exchange Systems II, or equivalent qualifications.

For further particulars, conditions of service and salary apply to C.E.P.O., Salisbury Plain District, Command Ordnance Depot, Tidworth, Hants. 4956

THE HEPWORTH IRON COMPANY LIMITED

DEVELOPMENT ENGINEER

MINIMUM qualification H.N.C. in Electrical Engineering and preferably well experienced in distribution and orthodox cable jointing practices. The successful candidate will be based at Kingston-upon-Thames and will be given considerable scope and every opportunity to develop new techniques, including the jointing of both paper and plastic-insulated cables.

Applications will be treated in the strictest confidence and should be sent under confidential cover, endorsed "Development Engineer," to the Sales Manager, The Hepworth Iron Company Ltd., 116, Canbury Park Road, Kingston-upon-Thames.

4972

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

CLERK OF WORKS, TRANSMISSION CONSTRUCTION DEPARTMENT (Vacancy No. 161/60).

Applicants will be required to supervise the construction of overhead lines and should have extensive experience in all phases of the construction of steel tower overhead lines using SCA conductor.

Salary will be in accordance with Grade 4 (£795-£870 per annum) of the National Joint Council Agreement.

Closing date for receipt of applications, 1st July, 1960.

This appointment will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller.
4969

TRANSFORMER DESIGNER

for transformers and L.F. chokes

(a) Laminated and 'C' Core pattern up to 5 kVA.

(b) Power transformers up to 500 kVA.

Salary according to age and experience. 5-day week. Contributory pension scheme.

Apply:

WILLESDEN TRANSFORMER COMPANY LTD.
Manor Park Road, London N.W.10
(Elgar 5445) 309

PROFESSIONAL ELECTRICAL ENGINEERS

MAKERS of special-purpose rotating electrical machines from 1-500 kW require two qualified Electrical Engineers, one to work in the design team under the Technical Manager, and one to work on development projects under the Development Engineer.

The Designer must be works trained in the above products, A.C. and D.C., and should have 10-15 years' design experience, preferably with some experience of control schemes and/or electronics.

The Development vacancy is suitable for a graduate who has completed a graduate apprenticeship, is interested in electrical research and development work, and has some experience of control schemes and/or light current engineering.

Full details (in strictest confidence) of age, training, qualifications and experience should be sent, marked "Confidential," to the :—

Managing Director
MAWDSLEY'S LIMITED
Dursley, Glos 4887

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment :—

FOURTH ASSISTANT ENGINEER, DIVISIONAL ELECTRICAL DEPT., LUTON TECHNICAL SECTION (Beds.).

Salary N.J.B. Class AX/DX, Grade 8, £735 × £25 to £860/£935 per annum. The commencing salary will depend upon qualifications and experience.

Previous experience in the commissioning of high-voltage electrical apparatus and associated protective gear would be an advantage.

The appointment will provide a basis for promotion to a higher technical grade and applicants should possess qualifications of Higher National Certificate standard.

The applicant appointed will be required to reside in the Luton area.

Applications, quoting Staff Vacancy No. 1344, stating age, qualifications, experience and present position should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., by 2nd July, 1960. 4942

ISLE OF WIGHT COUNTY COUNCIL

Isle of Wight Technical College

APPLICATIONS are invited for the full-time appointment of LECTURER in Electrical Engineering in the Department of Engineering. The teacher appointed will be required to teach electrical subjects for National Certificate and City and Guilds courses.

Qualifications should include Corporate Membership of the Institution of Electrical Engineers and a good industrial experience.

Salary will be in accordance with the Lecturer's scale of the Burnham Report.

Further particulars and forms of application (stamped addressed envelope) may be obtained from the Registrar, Isle of Wight Technical College, Hunnyhill, Newport, Isle of Wight, to whom they should be returned within two weeks of the appearance of this advertisement.

A. L. HUTCHINSON,
County Education Officer.
5018

SOUTHERN ELECTRICITY BOARD

District Engineer

READING District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class J, Grade 2 (£1,600 × £35 to £1,705 per annum). N.J.B. conditions of service.

Applicants should have had wide experience in the planning, construction, maintenance and operation of distribution systems both underground and overhead and involving substations, working at voltages up to 33,000. They should have had a full technical training and the possession of recognised qualifications in electrical engineering would be an advantage.

The successful candidate will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks., and returned to him, quoting Z.1194, not later than 4th July, 1960. 5000

SENIOR PRODUCT ENGINEER

RANCO LIMITED, TANNOCHSIDE, GLASGOW

A VACANCY exists in a light engineering factory for an ELECTRICAL ENGINEER of degree or similar status. Applicants should have experience in electric motor manufacture; fractional horse-power experience an advantage. The appointment is a new one and the position offers scope to persons of initiative.

Pension and life assurance schemes in operation.

Applications to the Personnel Manager, quoting ref. number 0/2/3. 4870

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

(Vacancy Number 138/60)

THIRD ASSISTANT ENGINEER (Operation and Maintenance, Transmission) is required for the District which is based at Northfleet Power Station. Candidates must possess H.N.C. in Electrical Engineering or equivalent qualification, and have had experience in the operation and maintenance of overhead lines, transformers and switchgear up to and including 275 kV. Experience in the direction of labour is essential.

Salary on new Common Scale, Class AX, Grade 6, £1,140-£1,355 per annum including London allowance.

Applications giving age, details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity House, Lower Ham Road, Kingston-upon-Thames, Surrey, to arrive by 6th July, 1960. 5017

Circuitry Draughtsmen

MEN who have had experience in the design or manufacture of high-voltage switchgear and are interested in circuit design are invited to apply for positions as CIRCUITRY DRAUGHTSMEN. Vacancies exist for both seniors and juniors, and training will be given to a selected number of applicants who have not had previous experience of this class of work.

Write stating age, qualifications and experience to :—

MACGREGOR BEAN & CO. LTD.

131, Malden Road, New Malden
Surrey

4944

ELECTRICIANS

FULLY qualified electricians required for general maintenance and installation work on large integrated iron and steel works. Excellent conditions; pension scheme in operation.

Apply to The Employment Officer, Appleby-Frodingham Steel Co., Scunthorpe, Lincs. 4891

TECHNICAL SALES ENGINEER

required by old-established manufacturer of rotary electrical equipment. This is a senior appointment which will admit to the company's pension scheme. Candidates should have considerable knowledge of electric motors and generators and their applications and should preferably hold a H.N.C. or equivalent qualification.

Salaries will be in accordance with experience and qualifications. Any 1960 holiday commitments will be honoured.

Please write giving full particulars to:—

Sales Director
SMALL ELECTRIC MOTORS LTD.
Churchfields Road, Beckenham, Kent.

5019

HERIOT-WATT COLLEGE, EDINBURGH

Electrical Engineering Department

APPLICATIONS are invited from Graduates in Engineering, preferably with Honours and possessing industrial experience, general and particular, in either Applied Electronics or Electrical Power and Machinery for LECTURESHIP IN ELECTRICAL ENGINEERING to take up duty on 1st September or as soon as possible thereafter. The successful candidate will be required to develop courses and to supervise research work in his subject. Salary scale £1,050 × £50 to £1,700, on which the successful candidate may be placed according to qualifications and experience.

Further particulars and forms of applications, which should be returned to the Principal not later than 1st July, may be obtained from the College. 4997

LONDON ELECTRICITY BOARD

General Assistant Engineers (2)

APPLICATIONS are invited for the above position. Initially the successful candidate will be located at Penrose Street, London, S.E.17.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and have completed a recognised period of training in the Electricity Industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the post within the National Joint Board Agreement, the provisional minimum salary will be £610 per annum rising to £745 per annum, inclusive of London allowance.

Application form obtainable from Personnel Officer, 46, New Broad Street, E.C.2. Please quote ref PER/V/2972/R. 4996

CITY OF CARDIFF

City Surveyor's Department

TECHNICAL ASSISTANT (Electrical), A.P.T. Grade 2 (£765-£880) and TRACER, General Division (£210-£595) required in the Electrical and the Heating and Ventilating Sections.

Apply to undersigned by the 9th July stating age, experience, qualifications and names and addresses of three referees, envelopes to be appropriately endorsed.

S. TAPPER-JONES,
Town Clerk.

City Hall,
Cardiff.

4941

BICC

ENGINEERS

required for the erection of steel tower and wood pole overhead transmission lines at home and overseas. Applicants should have a general engineering background up to O.N.C. level. Experience desirable but not essential. Permanent position including pension fund membership after satisfactory probation.

Applications giving full details of experience, age and qualifications to the

Staff Officer
BRITISH INSULATED CALLENDER'S CONSTRUCTION COMPANY LIMITED
30, Leicester Square
London, W.C.2

4990

HUDSWELL, CLARKE & CO., LTD.

AN ELECTRICAL ENGINEER is urgently required to fill a vacancy in the electrical department of this old-established firm.

The work involved would deal with the design and utilisation of electrical equipment for a large variety of specialised mechanical machinery.

Applicants should possess H.N.C. Electrical (or equivalent qualifications) and have experience in the design and installation of control schemes and instrumentation.

Please apply in writing, giving age and a brief outline of career to date to:

The Chief Designer
HUDSWELL, CLARKE & CO. LTD.
Olympia Works
Roundhay Road
Leeds, 8.

5005

LIFT ENGINEERS

LIFT ENGINEERS required for the erection and servicing of lifts in NIGERIA and GHANA. Wide experience of this work is essential and some knowledge of the more complicated high-speed installations would be an added advantage.

Appointments are to be made to the permanent staff and there are also contract vacancies for periods of 24 months. Salary dependent upon experience and terms of engagement but in the region of £1,300 to £1,500 per annum with free furnished quarters and generous allowances.

Full particulars of experience to—Box 4861.

DRAUGHTSMEN REQUIRED BY LIGHTING EQUIPMENT MANUFACTURER

A GOOD opportunity for young draughtsmen arises in the London office of a well-known and established manufacturer of a variety of specialised lighting fittings. Some works experience or training preferred.

Convenient to Victoria and Waterloo stations. 5-day week, contributory pension scheme.

Write fully to—Box 5004.

SENIOR DEVELOPMENT ENGINEER

AN experienced contactor development engineer is required, who is capable of producing sound designs in accordance with modern manufacturing techniques.

The company is well established, in an attractive coastal location and the position is a senior one carrying appropriate salary, etc.—Box 5007.

EMP ELECTRIC LIMITED

Garman Road, Tottenham, London, N.17

DRAUGHTSMAN, age 25/30, required for design of H.T. protective equipment. Sound training in electrical engineering is essential, but experience in lightning arresters and H.R.C. fuses is not necessary. H.N.C. standard required. Pension scheme in operation.

Apply in full confidence to Technical Director, stating age, education, experience and salary required. 4873

A WELL-known company manufacturing capacitors for industrial application has a vacancy for a sales engineer experienced in making surveys for power factor correction. The position is a progressive one and applicants should state their experience in this type of work, salary required, and whether they are able to travel throughout the British Isles. Write, please, to Personnel Manager.—Box 4945.

ASSISTANT electrical engineer required by national newspaper. Age 25/26. Electrical apprenticeship and Higher National. Must be first-class electrical draughtsman. Good prospects.—Box 4696.

***Situations Vacant** (continued)*

ASSISTANT storekeeper with 3-4 years' experience of the trade required by well-known electrical contractors in London, W.C. area. Good pay and conditions.—Box 4946.

BRANCH manager required by leading electrical contractors for West Midlands branch. Applicant must have current experience of, or be holding, a similar position. Remuneration to match experience. Replies in confidence stating all particulars to—Box 4973.

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., Longridge House, Manchester, 4. Electrical surveyors required in Ireland and Scotland. Permanent positions carrying progressive salary scale £800 to £1,100 and non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. 4978

CHIEF design and development engineer required for progressive electrical component manufacturing company. Full knowledge of RCS, BSI, CEE and CSA specifications essential; experience in switch and other small component design and in mass production techniques an advantage. Able to progress own work and control subordinates. Salary according to experience. Please write in first instance, giving qualifications and experience, to D. C. Phipps, Technical Director, Crater Products Ltd., Lower Guildford Road, Knaphill, Woking, Surrey. 4962

CLERK/accounts typist required. Permanent. Write stating age, exp., salary reqd.—Secretary, Alliance Electrical Co., 2, Henrietta Street, London, W.C.2. 4947

CONTROL circuit engineer and estimator for automatic motor control gear; O.N.C. or H.N.C. desirable with previous experience; permanent and pensionable situation. Apply giving details of age, experience and present salary, to—The Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey. 129

CRATER PRODUCTS Ltd., manufacturers of rotary switches, wish to appoint a number of representatives. Good connections are essential and will qualify for generous remuneration and expenses. Apply—Crater Products Ltd., Knaphill, Woking (Brookwood 2571). 4974

CROMPTON PARKINSON LTD. require a senior transformer designer for their Hayes works, Middx. Applicants should have degree or H.N.C. and preferably some years' experience with transformers up to 20,000 kVA and 66 kV, with on load lap changing gear. Write with full particulars of age, education, qualifications and salary required to the Personnel Officer, Clayton Road, Hayes, Middx. 4921

DESPATCH and pricing clerk, senior grade, required by old-established business in the lighting trade. Knowledge of this trade a considerable advantage. This is a well-paid permanent position with prospects. Reply stating age and experience to—Box 4948.

DRAUGHTSMAN (junior) electro/mechanical; interesting situation with excellent prospects. Apply giving full details of age, experience and present salary, to—The Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey. 130

EDITORIAL assistant for electrical engineering journal (London). Engineering or science degree and some engineering experience necessary. Journalistic knowledge desirable but those with literary ability would be considered. Good prospects for advancement. Pension scheme. Age approx. 25/30. Salary accord. quals. and exp. but commencing at approx. £850/£1,000 if within the stated age range.—Box 5008.

ELECTRICAL draughtsman required with H.N.C. or equivalent. Knowledge of factory installation work desirable. Non-contributory pension scheme. Excellent canteen facilities. Food factory in London area. State experience and salary required.—Box 4788.

ELECTRICAL engineer required for Glasgow office staff, age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler & Electrical Insurance Co. Ltd., 98, West George Street, Glasgow, C.2. 4979

ELECTRICAL contractors require young estimator with experience of industrial and commercial installation work. The Midland Electric Installation Co. Ltd., Cyprus Works, Upper Villiers Street, Wolverhampton. 5009

ELECTRICAL development. A junior electrical engineer required to assist in the development of small electro-mechanical assemblies. Duties will include experimental work, the testing of prototype and line products, and development and construction of test rigs and apparatus. Preferably aged 21-25 years, have served an apprenticeship and hold O.N.C. (Electrical). Apply — D. H. Bonnella & Son Ltd., West Hill, Hoddesdon, Herts (Tel. Hoddesdon 2283). 4851

ELECTRICAL engineering assistant, Borough Surveyor's Dept., Fulham Borough Council. Salary within range £635/£1,115. Applicants must have had experience in design and installation of street lighting and good general experience of electrical installations. 5-day week. Canteen. Details and application form from Town Clerk, Town Hall, London, S.W.6. Closing date 7th July. 5020

ELECTRICAL engineers with technical sales experience required by important commercial undertaking in Pakistan. Candidates must be Pakistani nationals, under the age of thirty, and possess a good degree. Applications in detail to—Box 4975.

ELECTRICAL manufacturer requires senior technical representative for Northern Ireland, working from Belfast branch office. Possibility of promotion to executive status shortly. Must have good knowledge of the electrical industry, have first-class connections with electrical wholesalers, contractors, consulting engineers, industrial users, etc. Applications will be considered from all areas. The appointment necessitates residence in Belfast, but would be subject to availability of Northern Ireland employment permit if not resident at the moment in Northern Ireland. Replies, which will be treated in confidence, should state age, education, experience and salary required. Bill Switchgear Ltd., Aston Lane, Perry Barr, Birmingham, 20. 5010

ELECTRICAL sales engineer required by large electrical contractor domiciled London area, with good appearance, education and contacts with consulting engineers, works engineers and architects, to promote new business. Reply stating age, past experience and salary required. —Box 4963.

ELECTRICAL staff required by consulting engineer for installation design on interesting projects for industry and commerce. Two grades: (a) engineer/draughtsman, age 20/27; (b) junior draughtsman, age 16/20 (with educational facilities). Meal vouchers, 5-day week, superannuation in higher grades. State age, experience, salary required.—G. H. Buckle & Partners, 2, Harrington Gardens, London, S.W.7. 4852

ENGINEER required with experience of development or testing of house service electricity meters. Higher National Certificate preferred.—Box 7551.

EXPANDING firm of consulting engineers, with international reputation, require intelligent electrical engineer/draughtsman, aged 19 to 25, to assist senior electrical engineers in the design and supervision of electrical installations in buildings of all types. Ideal situation for a man having recently completed his apprenticeship. Proved ability would result in greater responsibilities leading toward a position as a senior electrical engineer. Write—Steensen, Varming & Mulcahy, 146, New Cavendish Street, London, W.1. 4889

HEATING and ventilating engineers have an opportunity for assistant electrical engineer to be responsible for the preparation of wiring diagrams and site inspection of installations. Write giving full details and salary expected to Mr. A. Davey, Norris Warming Co. Ltd., Burley House, Theobalds Road, London, W.C.1. 4853

SALES engineers. Young engineers over 21 years required for indoor staff of sales department. Technical and works training in electrical engineering practice, at least to O.N.C. standard, is required by West London engineering company specialising in explosion-proof and industrial electrical control gear as well as other electrical equipment for industry. Candidates, in replying, should state age, training, qualifications and anticipated remuneration, in confidence, to—Box 182.

MAGNETIC amplifiers. Engineers required to design and develop magnetic amplifiers for various control applications. Some experience in this field is essential. Apply to Haddon Transformers Ltd., Victoria Park Industrial Estate, Field End Rd., Ruislip, Middx. 4890

SALES representative (young) required by manufacturers of wiring accessories, etc., to take over established connection. Greater London area. Knowledge of trade essential. Small car provided. Write full details—Box 4976.

SAO PAULO LIGHT S.A.—Serviços de Eletricidade, a company in Brazil and a subsidiary of the Canadian corporation Brazilian Traction, Light and Power Company Limited, invite applications from suitably qualified men for the position of deputy chief of its Piratininga Power Station. The power station was completed about five years ago and is situated near Sao Paulo (population over 3 millions; temperate climate, 2,200 ft. above sea level). The plant comprised initially 2 × 100-MW, 1,800-r.p.m. steam turbo-generator units each supplied at 850 p.s.i., 900° C. by one 850,000-lb./hr. oil-fired boiler, and has been recently expanded by the addition of two 125-MW reheat units, 1,800 p.s.i., 1,000° F. Applicants should have sound technical knowledge and good practical experience in the administration, operation and maintenance of steam-electric power stations; should also be of strong character with an aptitude for supervision and the maintenance of harmonious labour relations. Good salary, three years' agreement with first class passage both ways; four months' paid leave after three years' service. Written application in the first instance should be made to Mr. Osborne Mitchell, General Manager, Canadian-Brazilian Services Limited, 9/12, Cheapside, London, E.C.2. 4875

SECTION leader distribution switchboard assembly, apprentice trained. Small composite works N. London. £16 weekly with prospects. Staff and pension benefits.—Box 4862.

SENIOR and junior electrical design engineers/draughtsmen required for consulting engineers' office. 5-day week, luncheon vouchers, spring and summer holidays. Applicants for senior positions must be experienced in design of electrical services for modern hospitals, universities, factories, etc. Please apply stating age, experience and salary required to—J. Stinton Jones & Partners, 21, Gloucester Place, London, W.1. 185

SENIOR electrician for first-class electrical installation work required by well-known concern. Two years overseas. Good opportunity. Write age, experience, copy references. —Box 4809.

SERVICE engineer required for electro-mechanical equipment. Lift experience a definite advantage. Must be prepared to travel. Staff appointment. Pension fund. Apply in writing stating age, experience, salary required, etc., to Personnel Officer, Dewhurst & Partner, Ltd., Inverness Road, Hounslow. 5011

SPECIFICATION writer/engineer. A vacancy exists with Sangamo-Weston Ltd. at Enfield for a young man having a light electrical engineering background and preferably educated to H.N.C. standard, although candidates having an O.N.C. and continuing their studies will be considered. Work entails preparation of specifications of electrical measuring instruments to meet customers' requirements and liaison between development laboratories and contracts department. Write giving full details of experience, etc., to the Personnel Manager, Sangamo Weston Ltd., Cambridge Rd., Enfield, Middlesex. 4950

SUPERVISING electrical engineer required. Must be fully capable of and have experience in estimating for and carrying through to finalisation all types of commercial and industrial installations. Good salary, car allowance. Permanent and progressive position. Pension and staff bonus schemes. Write in confidence. —Cable Jointers Limited, 229, High Street, Acton, London, W.3. 4914

TECHNICAL representative required by substantial electrical contracting firm to call on architects, consultants, builders, etc., in Eastern Counties. Knowledge of installation work an advantage. Successful applicant will be required to ultimately live in Norfolk or Suffolk and would have opportunity of further advancement with progressive organisation. Possibility of ultimate directorship for capable man of pleasing personality who can create goodwill and secure enquiries.—Box 5012.

TELEPHONE maintenance engineers required for servicing automatic and manual installations in the Cardiff and Newport area. Permanent position with pension. Write full details age, experience to Reliance Telephone Co. Ltd., 18, Lawford St., Bristol, 2. 4964

TENBY ELECTRICAL ACCESSORIES require a representative for London, and one for Scotland. Technical knowledge and good connection with wholesale and area boards. Salary, commission, car, etc.—S. O. Bowker Ltd., 19/21, Warstone Lane, Birmingham, 19. 5013

THE HARLAND ENGINEERING Co. Ltd., Alloa, invite applications for a position as senior contracts engineer with engineering and commercial experience in hydraulic and/or electrical engineering. Experience in power station work an advantage. Higher National Certificate in engineering or equivalent. Full details of experience and salary required to—Contracts Director. 4977

TRANSFORMER engineer required by The British Electric Transformer Co. Ltd. for tendering and technical correspondence. Applicants must be fully experienced in this class of work and should be educated up to H.N.C. standard. Full particulars of age, experience and salary required to the Personnel Officer, The British Electric Transformer Co. Ltd., Hayes, Middx. 4951

TRANSFORMER representative for the electronic and industrial transformer fields. Preference will be given to a person already engaged in a similar capacity. Salary plus commission. Car will be supplied.—Willesden Transformer Co. Ltd., Manor Park Road, London, N.W.10 (Elgar 5445). 310

WORKS manager required for switchgear factory in Scotland. Must be capable of developing organisation and taking full control. Excellent prospects offered to right class of man having switchgear experience. All applications will be considered in strict confidence by the Managing Director.—Box 4924.

YOUNG engineer required to train for installation and maintenance of hospital X-ray apparatus. H.M.C.(Elect.) and some electronic experience preferred. Write giving age and experience.—Box 7564.

YOUNG man, with first-class experience in the lighting trade, required to take up interesting position in connection with distribution and stores control, in old-established business. Reply stating age, salary required and experience to—Box 4949.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ELEC. eng. (39), exp. home/overseas, mining/electronics/winding, bilingual, Port., some Span., seeks post. References.—Box 7562.

SALES liaison engineer with good knowledge of cable, lighting, distribution, radio and telecommunications equipment, possessing established connections with E.E. Board, industry and municipalities in East Anglia, desires to join firm wishing to improve their technical representation.—Box 7552.

SENIOR sales representative (38) seeks advancement. Wide experience and contacts with Government departments, nationalised industries, large users, etc.—Box 7558.

TURBINE erector, age 36, site engineer, returning U.K. July after prolonged service abroad, open to engagement in responsible capacity on power plant erection, maintenance or similar work, preferably abroad.—Box 7549.

ARTICLES FOR SALE

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

600

WARD LEONARD SETS

All incorporating motor generator sets comprising slipring motors normally 1,440 or 960 r.p.m., with direct coupled generators and excitation equipment, together with A.C. and D.C. control gear.

TYPICAL WORK MOTORS

H.P.	Maker	Voltage	Speed
0/340	E.E.C.	0/480	0/1500
0/225/225	HARLAND	0/250	0/1450/1750
0/200	W'HOUSE	0/230	0/1750
0/160	CROM.PARK.	0/480	0/1000
0/150	MET. VICK.	0/500	0/1500
0/130/150	M. & PLATT	0/500	0/360/500
0/130	L.D.C.	0/220	0/1000
0/100/100	L.D.C.	0/220	0/750/960
0/95	ALLEN	0/220	0/1300
0/60/60	ALLEN	0/230	0/1300/1500
0/74	L.S.E.	0/480	0/2900
0/60/60	E.E.C.	0/500	0/2000/2900

Others available down to 3 h.p. Wide choice of speeds all covered by guarantee.

GEORGE COHEN
Sons & Co. Ltd.
Wood Lane, London, W.12
(Shepherds Bush 2070)
Stanningley, Nr. Leeds
(Pudsey 2241)

4855

MOTORS

NEW CROMPTON PARKINSON, from ½ h.p. to 80 h.p.; also 6,000 A.C. and D.C. reconditioned Motors and Starters.

IN STOCK HERE

B. E. WHITE
Brantwood Rd., Tottenham, London, N.17
Tel. EDMonton 4621-2 215

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W4. 57

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 55/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 2234/5/6). 169

600

COMMUTATOR MOTORS
400/440/3/50

H.P.	Make	Speed	Remarks
67.5/270	B.T.H.	95/370	Schrage
35/70	B.T.H.	650/1300	Schrage
20/40	B.T.H.	300/1000	Schrage
20/40	B.T.H.	45/90	Geared
1.5/5	L.S.E.	900/3000	Ind. Reg. Control
.3/3	L.S.E.	300/3000	Ind. Reg. Control

400 CPS ALTERNATORS

New, 5 kVA, 115/200 volts-3-400 cps, dual voltage (delta/star) sinusoidal wave form, 3,000 r.p.m.. Rectifier excited with A.V.R. Ex stock.

Other sizes up to 40 kVA for short delivery.

GEORGE COHEN
Sons & Co. Ltd.
Wood Lane, London, W.12
(Shepherds Bush 2070)
Stanningley, Nr. Leeds
(Pudsey 2241)

4791

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

ALTERNATORS and generators, all types up to 150 kW.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 151

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 170/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (ISLeworth 4534/5). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists. — Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

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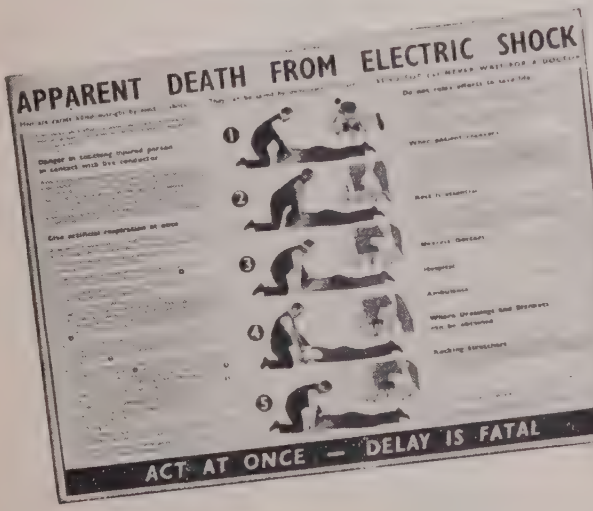

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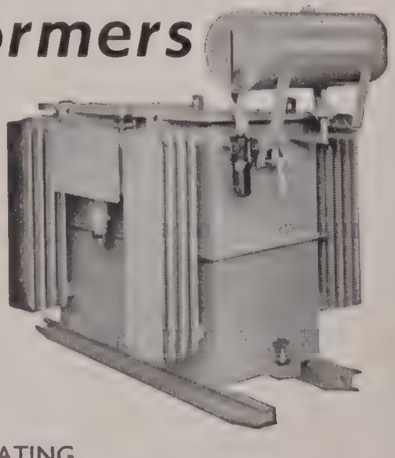

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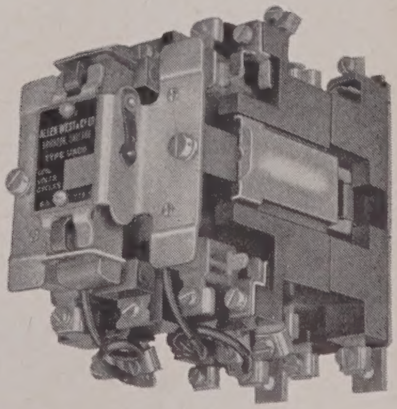

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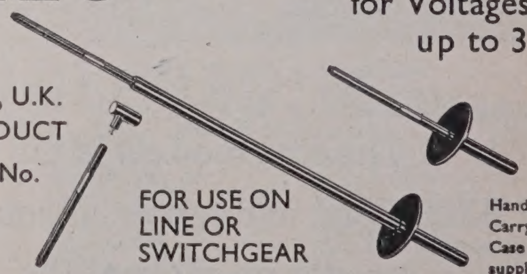

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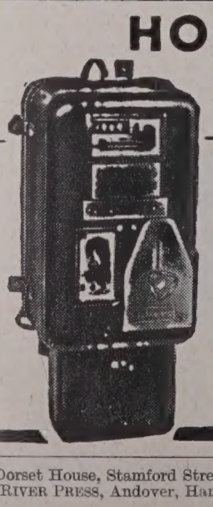

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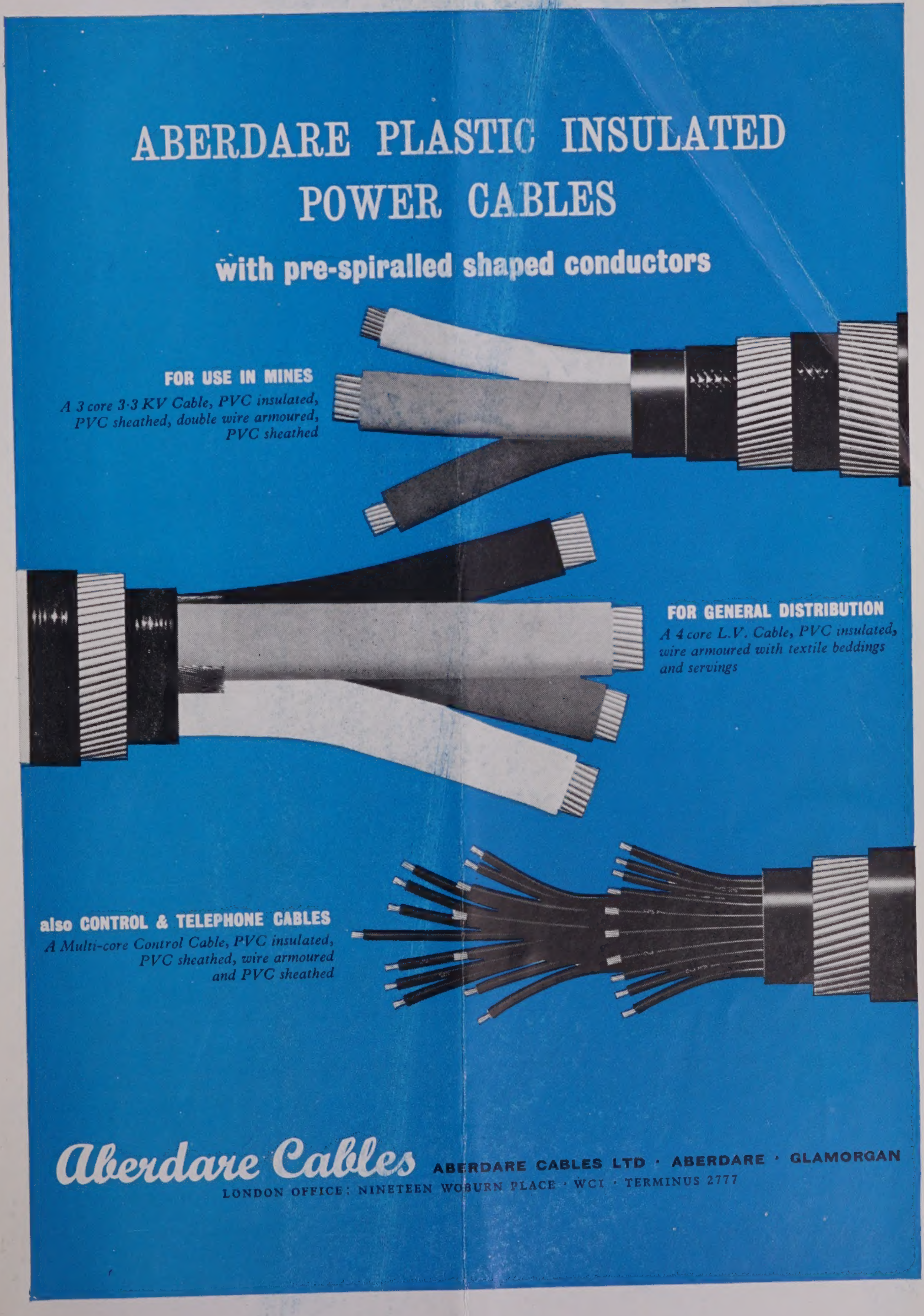

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